WBS	Name	Cost	M&S Cont.	Labor Cont.
	Test protoype spacetube	$3,318	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	25%	40 hrs	0 days	Fri 5/30/03	Thu 6/26/03
13	MechTechSF	10%	16 hrs	0 days	Fri 5/30/03	Thu 6/26/03
15	CMMProgrammerSF	25%	40 hrs	0 days	Fri 5/30/03	Thu 6/26/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	25%	$1,694	$0	$0	$1,694
13	MechTechSF	10%	$464	$0	$0	$464
15	CMMProgrammerSF	25%	$1,160	$0	$0	$1,160

Notes

The structural characteristics of the protoype will be tested and compared to the FEA predictions.

	Fabricate support cradle	$25,369	0.5	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	10%	31.2 hrs	0 days	Thu 1/29/04	Tue 3/23/04
13	MechTechSF	100%	312 hrs	0 days	Thu 1/29/04	Tue 3/23/04
17	MANDS	15,000	15,000	0 days	Thu 1/29/04	Wed 3/24/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	10%	$1,321	$0	$0	$1,321
13	MechTechSF	100%	$9,048	$0	$0	$9,048
17	MANDS	15,000	$15,000	$0	$0	$15,000

Notes

This cradle supports the space tube while the barrels and installed and aligned. It is mounted on
roller bearings which ride the rails on the CMM. This allows it to move around during installation of the beampipe and during installation into ISL.
Cost estimate frm G. Derylo and Y.Orlov April 18, 2002.

1.1	**Run 2b Silicon Project**	**$10,101,364**	**0**	**0**

Notes

Table summarises the number of parts needed to the project:

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Run 2b Silicon Project" continued

Notes

Layer	Type	Φ-seg.	Z-seg.	Length	Width	Pitch	Total
5	A	30	6	96.4	40.5	75/37.5	360
5	A	30	6	96.4	40.5	75/37.5	360
4	A	24	6	96.4	40.5	75/37.5	288
4	2.5°	24	6	96.4	43.1	80/40	288
3	A	18	6	96.4	40.5	75/37.5	216
3	2.5°	18	6	96.4	43.1	80/40	216
2	A	12	6	96.4	40.5	75/37.5	144
2	2.5°	12	6	96.4	43.1	80/40	144
1	A	6	6	96.4	40.5	75/37.5	72
1	A	6	6	96.4	40.5	75/37.5	72
0	A	12	6	96.4	14.8	50/25	144

	Sensors	Modules	Staves	4-chips hybrids	2-chips hybrids	MPC	JPC
Outer Axials	1512	756	180	1080	0	180	40
Outer Stereo	648	324					
L0	144	72	0	0	72	0	16
TOTAL	2304	1152	180	1080	72	180	56

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1	DAQ	$4,742,979	0	0
1.1.1.1	SVX4 Chips	$802,925	0	0

Notes

Runs:
1. Prototype (Hybrid #1)
2. Contingency (Hybrid #2)
3. Production (Preproduction and Production hybrids)

Need **4,464** chips for the project

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.1.1	SVX4 chip: 1st Prototype	$224,147	0	0

Notes

First full svx4 chip prototype. It has all functionality of the final chip.

Risk:
The schedule already assumes the need for a second submission.
No risk for this task.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.1.1.1	1st chip: layout	$128,611	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish
2	FNALR&D	0%	0 hrs	0 days	Mon 7/2/01	Mon 7/2/01
8	ElecEngF	30%	453.6 hrs	0 days	Mon 7/2/01	Thu 4/4/02
16	PostDocU	100%	1,512 hrs	0 days	Mon 7/2/01	Thu 4/4/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	$105,500	$0	$105,500	$0
8	ElecEngF	30%	$23,111	$0	$23,111	$0
16	PostDocU	100%	$0	$0	$0	$0

Notes

Cost:
This is half the amount charged to FNAL from LBL on Run 2b budget codes (split with D0) = 80.5k$.
It covers the labor cost at LBL upto the submission of the 1 prototype chip.
INFN contributed with $25,000 (Buy Backs).
Labor:
LBL provided an equivalent of ~1.6 FTE to the project (Costed as R&D)
FNAL provided an equivalent of 0.3 FTE on the project (Costed as Labor)
INFN-Padova provided ~1 FTE on the project (Not Costed)

1.1.1.1.1.2	1st Chip submission (eng. Run)	$0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	100%	0 hrs	0 days	Thu 4/4/02	Thu 4/4/02	$0	$0	$0	$0

Notes

Schedule:
This is the first submission of the new svx4 chip on 0.25um technology.
The minimum order is for ~10wafers and is a joint CDF,D0 and BTeV submission (not equally divided).

1.1.1.1.1.3	1st chip: documentation	$7,500	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	0 hrs	0 days	Thu 4/4/02	Thu 4/4/02	$7,500	$0	$7,500	$0

Notes

Labor:
This is labor at LBL associated with producing the necessary documentation for the chip.

1.1.1.1.1.4	1st Chip: manufacturing	$58,000	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish
2	FNALR&D	0%	0 hrs	0 days	Thu 4/4/02	Thu 4/4/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	$58,000	$0	$58,000	$0

WBS	Name	Cost	M&S Cont.	Labor Cont.

"1st Chip: manufacturing" continued

Notes

Schedule:
8 weeks for fabrication at TSMC
Cost:
total cost is 200K$ for 10 wafers minimum order. This order is split between CDF, D0 and BTeV
Cost for CDF is 50K$ for masks + 8K$ for chips

1.1.1.1.1.5 1st Chip: postprocessing $5,000 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	0 hrs	0 days	Fri 6/14/02	Fri 6/14/02	$5,000	$0	$5,000	$0

Notes

Schedule:
2 weeks for backgrounding, backplating and dicing
Cost:
Total is 15K$ (Engineering Estimate). CDF part is 5K$

1.1.1.1.1.6 1st Chip: engineering evaluation at FNAL $8,152 0 1

ID	Resource Name	Units	Work	Delay	Start	Finish
8	ElecEngF	100%	160 hrs	0 days	Tue 7/16/02	Mon 8/12/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	ElecEngF	100%	$8,152	$0	$2,038	$6,114

Notes

Labor:
This is FNAL labor only. It included enginnering type tests.
The start date lags behind the LBL testing start date due to
shipping and setup at FNAL.

1.1.1.1.1.7 1st Chip: engineering evaluation at LBL $13,812 1 0

ID	Resource Name	Units	Work	Delay	Start	Finish
2	FNALR&D	0%	0 hrs	0 days	Fri 6/28/02	Fri 6/28/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	$13,812	$0	$13,812	$0

Notes

Labor:
This is labor cost at LBL as from Henrik Van Der Lippe and Ray Yarema (3/19/02)
project file svx4_0202.mpp of March 20 2002.
Tests performed at LBL include radiation damage assesment. Other tests including radiation damage assesment will also be performed at INFN-Padova.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.1.1.8	1st Chip: evaluation and radiation tests	$3,072	0	1

ID	Resource Name	Units	Work	Delay	Start	Finish
7	PhysicistF	50%	320 hrs	0 days	Mon 7/1/02	Tue 10/22/02
9	ElecTechF	20%	128 hrs	0 days	Mon 7/1/02	Tue 10/22/02
16	PostDocU	150%	912 hrs	4 days	Mon 7/8/02	Tue 10/22/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PhysicistF	50%	$0	$0	$0	$0
9	ElecTechF	20%	$3,072	$0	$307	$2,765
16	PostDocU	150%	$0	$0	$0	$0

Notes

General:
This is the evaluation of the chip with CDF Data Aquisition System. Also we will evaluate the performance of the chip with real sensor using both a laser and a radiactive source.
Labor:
1) Postdocs (150%) for testing the chip with the real DAQ, modify programs etc.
2) electrical technician (20%) needed for support with electrical board stuffing/testing.
3) Scientist (50%) to coordinate the effort

1.1.1.1.1.9	1st Chip ready for hybrids	$0	0	0

Notes

Schedule:
This is 1 month after receiving the Eng.run parts back from manufacturing.
This is agressive and assumes the chip works without major problems.

1.1.1.1.2	**SVX4 chips: 2nd prototype**	**$181,300**	**0**	**0**

Notes

It could be either the preproduction quantity (if the first prototype is succesfull) or the 2nd prototype chip run (if the first prototype is not succesfull). Order quantity may vary depending on the level of success of the first chip prototype.
The schedule assumes that this is the 2nd prototype but we costed it as a preproduction.

Risk:
50% chance that we need 2 submissions (this is the 2nd submission)
10% prob. for design or manufacturing failure
Total = 5% risk
Effect is one more submission round:
Cost 100%
Schedule 100%
No change in scope, or Technical.

1.1.1.1.2.1	2nd Chip: layout	$62,188	1	1

ID	Resource Name	Units	Work	Delay	Start	Finish
2	FNALR&D	0%	0 hrs	0 days	Tue 10/22/02	Tue 10/22/02
8	ElecEngF	100%	160 hrs	0 days	Wed 10/23/02	Tue 11/19/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	$54,036	$0	$0	$54,036

WBS	Name	Cost	M&S Cont.	Labor Cont.

"2nd Chip: layout" continued

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	ElecEngF	100%	$8,152	$0	$0	$8,152

Notes

This starts after chip evaluation completes, but it could start earlier.
Labor:
moslty LBL labor
FNAL will provide 1 engineer for 20 days during this period

1.1.1.1.2.2 2nd Chip: submission (eng. Run) $0 0 0

Notes

General:
This is the 2nd engineering run submission with only svx4 devices. If changes are minor wrt 1st chip, all production wafers might be ordered at this time. For the purpose of this schedule we will order here 5 wafers worth of svx4 chips for CDF

1.1.1.1.2.3 2nd Chip: manufacturing $100,000 0.3 0

ID	Resource Name	Units	Work	Delay	Start	Finish
2	FNALR&D	0%	0 hrs	0 days	Tue 11/19/02	Tue 11/19/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	$100,000	$0	$0	$100,000

Notes

Cost:
The minimum order cost is 200K$ which yields 10 wafers worth of chips.
100K$ is the CDF part. We also may want to order extra wafers to get us through the preproduction phase. The extra cost is 25K$ (10 wafers) which we have as contingency.

1.1.1.1.2.4 2nd Chip: postprocessing $7,500 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish
2	FNALR&D	0%	0 hrs	0 days	Tue 2/11/03	Tue 2/11/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	$7,500	$0	$0	$7,500

Notes

Schedule:
2 weeks for backgrounding, backplating and dicing
Cost:
Total is 15K$ (Engineering Estimate). CDF part is 7.5K$

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.1.2.5	2nd Chip: engineering evaluation at FNAL	$4,076	0	1

ID	Resource Name	Units	Work	Delay	Start	Finish
8	ElecEngF	50%	80 hrs	0 days	Wed 2/26/03	Tue 3/25/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	ElecEngF	50%	$4,076	$0	$0	$4,076

Notes

Most of the "low level" testing will be performed at LBL.
FNAL labor is mostly in testing the chip with the final DAQ chain at SiDet and Feynman.

1.1.1.1.2.6	2nd Chip: engineering evaluation at LBL	$6,000	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish
2	FNALR&D	0%	0 hrs	0 days	Tue 2/25/03	Tue 2/25/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	$6,000	$0	$0	$6,000

Notes

Labor:
This is labor cost at LBL as from Henrik Van Der Lippe
project file svx4_0202.mpp of March 20 2002.
Tests performed at LBL include radiation damage assesment.

1.1.1.1.2.7	2nd Chip: evaluation and radiation test	$1,536	0	1

ID	Resource Name	Units	Work	Delay	Start	Finish
7	PhysicistF	50%	160 hrs	0 days	Wed 2/26/03	Tue 4/22/03
9	ElecTechF	20%	64 hrs	0 days	Wed 2/26/03	Tue 4/22/03
16	PostDocU	150%	480 hrs	0 days	Wed 2/26/03	Tue 4/22/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PhysicistF	50%	$0	$0	$0	$0
9	ElecTechF	20%	$1,536	$0	$0	$1,536
16	PostDocU	150%	$0	$0	$0	$0

Notes

General:
This is the evaluation of the chip with CDF Data Aquisition System. Also we will evaluate the performance of the chip with real sensor using both a laser and a radiactive source.
Labor:
1) Postdocs (100%) for testing the chip with the real DAQ, modify programs etc.
2) electrical technician (20%) needed for support with electrical board stuffing/testing.
3) Scientist (50%) to coordinate the effort

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.1.2.8	2nd Chip ready for hybrids	$0	0	0

Notes

Schedule:
This is 4 weeks after receiving the Eng.run parts.
This allows 2 weeks for post processing and 2 more weeks for testing and dicing.
It assumes the chip works without major problems.

1.1.1.1.3	**SVX4 chip: production**	**$397,479**	**0**	**0**

Notes

Oredr production quantity of the svx4 chip. It assumes that either the first or the second prototype chip has been succesfull.

1.1.1.1.3.1	Setup for production chip testing	$7,708	0.5	0.5

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*
7	*PhysicistF*	*50%*	*80 hrs*	*0 days*	*Wed 3/26/03*	*Tue 4/22/03*
8	*ElecEngF*	*25%*	*40 hrs*	*0 days*	*Wed 3/26/03*	*Tue 4/22/03*
9	*ElecTechF*	*50%*	*80 hrs*	*0 days*	*Wed 3/26/03*	*Tue 4/22/03*
17	*MANDS*	*3,750*	*3,750*	*0 days*	*Wed 3/26/03*	*Tue 4/22/03*

ID	*Resource Name*	*Units*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
7	*PhysicistF*	*50%*	*$0*	*$0*	*$0*	*$0*
8	*ElecEngF*	*25%*	*$2,038*	*$0*	*$0*	*$2,038*
9	*ElecTechF*	*50%*	*$1,920*	*$0*	*$0*	*$1,920*
17	*MANDS*	*3,750*	*$3,750*	*$0*	*$0*	*$3,750*

Notes

Schedule:
This is time for getting programs setup and procedures worked out for testing chips on wafers.
Labor:
Same crew as for the final production testing.
We assume that 1 scientist, 1 technician and 1 research associate will work full time on this task which is both for CDF and D0.
Below is the CDF share:
1. Scientist (50%)
2. Elect. Technician (50%)
3. postdoc (25%) support to CDF
4. Research Associate (50%)
5. Elect. Engineer (5%) chip designer expert
Cost:
Cost is for probe cards, equipment and material. Total (engineering estimate) is $7,500 plus $2,500 for contingency.
CDF share is 50% :
$3,750 EQ
$1,250 CONT.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.1.3.2	Production Chip: layout	$36,868	1	1

ID	Resource Name	Units	Work	Delay	Start	Finish
8	ElecEngF	50%	80 hrs	0 days	Wed 4/23/03	Tue 5/20/03
18	MANDSPASS	32,792	32,792	0 days	Wed 4/23/03	Tue 5/20/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	ElecEngF	50%	$4,076	$0	$0	$4,076
18	MANDSPASS	32,792	$32,792	$0	$0	$32,792

Notes

Labor:
moslty LBL labor.
FNAL will provide help with an engineer 100% for 15 days during this period.

1.1.1.1.3.4	Production chip Submission	$0	0	0

Notes

Milestone not linked to anything, it could start as early as 40
days after receiving the engineering run chips

1.1.1.1.3.5	Production Chip: manufacturing	$325,000	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
18	MANDSPASS	325,000	325,000	0 days	Wed 5/21/03	Thu 7/31/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
18	MANDSPASS	325,000	$325,000	$0	$0	$325,000

Notes

Cost:
Based on MOSIS (TSMC) price.
We need about 5000 chips in the detector + 2,000 spares
We order 14,000 chips to include yield. This is a conservative yield of 50%.
Masks cost is 150K$ (to be split with D0) and 50K$/lot (1lot = 10 wafers). Need to order 5 lots.
Total = 75K$ + 250 K$ = 325K$
INFN contributes for 112 Keuro = 100 K$ (Buy Backs)
Contingency is 50% This is to cover any change in wafer cost and the risk of a lower yield.

1.1.1.1.3.6	Production Chip: postprocessing	$10,000	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish
18	MANDSPASS	10,000	10,000	0 days	Fri 8/1/03	Thu 8/14/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
18	MANDSPASS	10,000	$10,000	$0	$0	$10,000

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Production Chip: postprocessing" continued

Notes

Schedule:
2 weeks for backgrounding, backplating and dicing.
Cost:
Total cost is $200 per wafer (Engineering Estimate). For 50 wafers = 10K$

1.1.1.1.3.7 Production Chip: engineering evaluation at LBL $4,500 1 0

ID	Resource Name	Units	Work	Delay	Start	Finish
18	MANDSPASS	4,500	4,500	0 days	Fri 8/15/03	Fri 9/19/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
18	MANDSPASS	4,500	$4,500	$0	$0	$4,500

Notes

Labor:
This is labor cost at LBL as from Henrik Van Der Lippe
project file svx4_0202.mpp of March 20 2002.
Tests performed at LBL include radiation damage assesment.

1.1.1.1.3.8 CDF chips: Test $13,403 0 1

ID	Resource Name	Units	Work	Delay	Start	Finish
7	PhysicistF	50%	392 hrs	0 days	Fri 8/22/03	Thu 1/15/04
8	ElecEngF	10%	78.4 hrs	0 days	Fri 8/22/03	Thu 1/15/04
9	ElecTechF	50%	392 hrs	0 days	Fri 8/22/03	Thu 1/15/04
16	PostDocU	150%	1,176 hrs	0 days	Fri 8/22/03	Thu 1/15/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PhysicistF	50%	$0	$0	$0	$0
8	ElecEngF	10%	$3,995	$0	$0	$3,995
9	ElecTechF	50%	$9,408	$0	$0	$9,408
16	PostDocU	150%	$0	$0	$0	$0

Notes

Schedule:
We are assuming 44 wafers, 320 chips/wafer, and testing rate of 0.5 wafer/day (includes classifying and sorting chips). It will take 88 days.
2 weeks added for dicing at the end.
1 week added for setup time at the beginning.
Labor:
1 scientist 50% time for supervision, 1 technician and 1 research associate(or grad students) 75% time each on this for CDF.
Below is the CDF share:
1. Scientist (50%)
2. Elect. Technician (50%)
3. Research Associate (150%)
4. Elect. Engineer (10%) chip designer expert

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.1.3.9	Production Chips ready for hybrids	$0	0	0

Notes

Schedule:
1st chips are available 2 weeks after start of testing to take into account the testing, dicing and logging necessary. This follows the experience with Run IIa.

1.1.1.1.3.10	Chip testing Complete	$0	0	0
1.1.1.2	**Transceiver Chips**	**$52,107**	**0**	**0**

Notes

A new transceiver chip in 0.25um technology (same as the SVX4) is needed in order to minimise the power consumption at the mini-portcard level and the number of indipendent power supply lines needed for the porject (we completely drop the 5V supply line for the mini-PC).
The new transceiver chip is only 2.52x2.88 mm^2.
The backup solution is to re-use the old Honeywell 0.85um rad-hard transceiver chip. These old chips are available in quantity sufficient to cover the needs of this project.
The mini-portcard prototype#1 uses the old chip. The new chip should be available for the 2nd mini-portcard round and for all the L0 hybrids.
The mini-portcard needs 4 new transceiver chip (or 5 old ones). The L0 hybrid needs 1 transceiver chip (either old or new).
Total number of transceiver chips needed (new) is 180*4+72 = **792**.

1.1.1.2.1	**Transceiver chip Prototype**	**$38,073**	**0**	**0**
1.1.1.2.1.1	Transceiver: specifications	$1,529	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*
8	*ElecEngF*	*75%*	*30 hrs*	*0 days*	*Wed 5/22/02*	*Wed 5/29/02*

ID	*Resource Name*	*Units*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
8	*ElecEngF*	*75%*	*$1,529*	*$0*	*$1,529*	*$0*

Notes

Specificiation, internal components and pad layout for the chip.

1.1.1.2.1.2	Transceiver: layout	$10,190	0	0.5

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*
8	*ElecEngF*	*100%*	*200 hrs*	*0 days*	*Thu 5/30/02*	*Wed 7/3/02*

ID	*Resource Name*	*Units*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
8	*ElecEngF*	*100%*	*$10,190*	*$0*	*$10,190*	*$0*

Notes

Chip layout (including simulation/verification)

1.1.1.2.1.3	Project Pacing: transceiver layout	$0	0	0
1.1.1.2.1.4	Transceiver: MPR submission	$0	0	0

Notes

This is a MUST date to submit the transceiver chip to a multiproject submission via MOSIS.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.2.1.5	Transceiver: fabrication	$19,958	0.3	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
2	FNALR&D	0%	0 hrs	0 days	Mon 7/15/02	Mon 7/15/02
8	ElecEngF	10%	40 hrs	0 days	Mon 7/15/02	Mon 9/23/02
9	ElecTechF	20%	80 hrs	0 days	Mon 7/15/02	Mon 9/23/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	$16,000	$0	$16,000	$0
8	ElecEngF	10%	$2,038	$0	$102	$1,936
9	ElecTechF	20%	$1,920	$0	$96	$1,824

Notes

Required time for fabrication is 8 weeks + 4 weeks contingency.
Cost:
$14,000 for the minimum wafer space on a multiproject run. We will get ~40 chips. Schedule and cost includes dicing.
A simple test card will also be developed to test the chip.
Cost: $2,000 (PCB and parts) based on Engineering estimate.
Labor:
1. Electrical Eng. (10%) 1 week
2. Electrical Tech (20%) 2 weeks

1.1.1.2.1.6	Transceiver: evaluation	$6,396	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
7	PhysicistF	10%	16 hrs	0 days	Tue 9/24/02	Mon 10/21/02
8	ElecEngF	50%	80 hrs	0 days	Tue 9/24/02	Mon 10/21/02
12	ElecTechSF	50%	80 hrs	0 days	Tue 9/24/02	Mon 10/21/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PhysicistF	10%	$0	$0	$0	$0
8	ElecEngF	50%	$4,076	$0	$0	$4,076
12	ElecTechSF	50%	$2,320	$0	$0	$2,320

Notes

This is an engineering evaluation of the chip.

1.1.1.2.2	**Transceiver chip Production**	**$14,034**	**0**	**0**
1.1.1.2.2.1	Transceiver: layout modification	$4,076	0	1

ID	Resource Name	Units	Work	Delay	Start	Finish
8	ElecEngF	100%	80 hrs	0 days	Tue 10/8/02	Mon 10/21/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	ElecEngF	100%	$4,076	$0	$0	$4,076

1.1.1.2.2.2	Project Pacing: transceiver layout modification	$0	0	0

WBS	Name	Cost	M&S Cont.	Labor Cont.
"Project Pacing: transceiver layout modification" continued				
1.1.1.2.2.3	Transceiver: submission	$0	0	0

Notes
This submission goes with the 2nd prototype chip submission.

1.1.1.2.2.4	Transceiver: fabrication	$0	0	0

Notes
The transceiver chips occupies space left over from the SVX4 reticule.
There are 150 transceiver per wafer. No extra cost associated with this chip.

1.1.1.2.2.5	Transceiver: postprocessing	$2,000	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	2,000	2,000	0 days	Wed 2/12/03	Tue 2/25/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	2,000	$2,000	$0	$0	$2,000

Notes
Cost:
this is the estimated added cost for the dicing of the transceiver chips. Basic dicing costs are already priced with the svx4 chip (2nd engineering run)

1.1.1.2.2.6	Transceiver: evaluation	$2,038	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
8	ElecEngF	50%	40 hrs	0 days	Wed 2/26/03	Tue 3/11/03
16	PostDocU	50%	40 hrs	0 days	Wed 2/26/03	Tue 3/11/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	ElecEngF	50%	$2,038	$0	$0	$2,038
16	PostDocU	50%	$0	$0	$0	$0

1.1.1.2.2.7	Transceiver: testing	$5,920	0.5	1

ID	Resource Name	Units	Work	Delay	Start	Finish
7	PhysicistF	25%	40 hrs	0 days	Wed 3/12/03	Tue 4/8/03
9	ElecTechF	50%	80 hrs	0 days	Wed 3/12/03	Tue 4/8/03
17	MANDS	4,000	4,000	0 days	Wed 3/12/03	Tue 4/8/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PhysicistF	25%	$0	$0	$0	$0
9	ElecTechF	50%	$1,920	$0	$0	$1,920
17	MANDS	4,000	$4,000	$0	$0	$4,000

Notes
Schedule:
Testing setup for the transceiver chip is estimated to be 2 weeks.
Testing should proceed at least at the same rate as the svx4 chip (1 wafer/day).

WBS	Name	Cost	M&S Cont.	Labor Cont.
"Transceiver: testing" continued				
	Notes Total number of wafers is 20 (for both CDF and D0). With 150 transceiver chips/wafer this should be enough to ensure transceiver chip for the entire project (3,000 chip vs 800 needed) Cost: For probecards, equipment and material. Estimated cost is $4,000. Contingency is 50%			
1.1.1.2.2.8	Transceiver Chips available	$0	0	0
1.1.1.2.2.9	Transceiver Chips Complete	$0	0	0
1.1.1.3	**Hybrids**	**$1,656,392**	**0**	**0**
	Notes The Hybrid is a BeO substrate (2cmx3.9cm). Included in the bydrids are: 1. 4 SVX4 chips. 2. miscellanea components (capacitors,resistors, thermistor). 3. pitch adapters 4. testing boards Runs (4 chips hybrids): 1. Prototype#1 (milestone #1 "electrical stave test") 2. Protoype#2-Contingency (milestone #2 "contingency electrical stave test") 3. Preproduction (milestone #3 "preproduction electrical stave test") 4. Production (milestone #4 "Production electrical stave test") Need **1,080** 4-chips hybrids and **72** 2-chips hybrid for the project			
1.1.1.3.1	**Outer layers**	**$1,455,658**	**0**	**0**
	Notes Runs (4 chips hybrids): 1. Prototype (milestone #1 "prototype electrical stave test"), Proto#1 chip 2. Contingency (milestone #2 "contingency electrical stave test"), Proto#2 chip 3. Preproduction (milestone #3 "preproduction electrical stave test"), Production chips 4. Production (milestone #4 "Production electrical stave test"), Production chips Need **1,080** hybrids			
1.1.1.3.1.1	**Outer Hybrid prototypes**	**$175,986**	**0**	**0**
1.1.1.3.1.1.1	Hybrid #1: Layout	$0	0	0
	Notes Cost of the layout (CAD etc.) is in the manufacturing cost.			
1.1.1.3.1.1.2	Hybrid#1: Submission	$0	0	0

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.3.1.1.3	Hybrid #1: manufacturing	$87,993	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish
2	FNALR&D	0%	0 hrs	0 days	Thu 5/2/02	Thu 5/2/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	$87,993	$0	$87,993	$0

Notes

Schedule:
We are planning to order 40 hybrids (outer layers=4chips) to have enough for building 5 staves plus spares.
Cost:
Based on "FY2002 development cost for CDF Run2b Hybrids & stave bus"
V6.0 Mar-24-2002 (C.Haber, LBL)
Parts, number of parts:
1. Hybrids, 40
2. bus cables, 15
3. pitch adapter, 40
4. hybrid test card, 40
5. BeO blanks for mini port cards, 15
Total cost (including Labor, overhead and test costs) = $87,993

Contingency here covers this, plus the possible #2 manufacturing round. pl

1.1.1.3.1.1.4	Hybrid #1 ready for chips	$0	0	0

Notes

Schedule:
This is 10 days after receiving hybrids to allow for some minimal test.

1.1.1.3.1.1.5	Hybrid assembly and evaluation at LBL	$0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish
7	PhysicistF	50%	40 hrs	0 days	Tue 7/23/02	Mon 8/5/02
16	PostDocU	150%	120 hrs	0 days	Tue 7/23/02	Mon 8/5/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PhysicistF	50%	$0	$0	$0	$0
16	PostDocU	150%	$0	$0	$0	$0

Notes

Labor:
Test are done at LBL (no FNAL labor)
No labor cost for FNAL.
Total non FNAL Labor is estimated to be 2 full time physicists for prototype hybrid testing.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.3.1.1.6	Hybrid #1 available	$0	0	0

Notes

Available means chips are already mounted bonded and tested with the hybrids.
Schedule:
We are assuming this will be 3 weeks after substrate are available (test and load the substrate) and 2 weeks after chips are available (for mounting, bonding and testing).
This is part of our 1st project milestone (testing an electrical stave).

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.3.1.1.7	Hybrid #1: Evaluation	$0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish
7	PhysicistF	50%	240 hrs	0 days	Tue 8/6/02	Tue 10/29/02
16	PostDocU	200%	960 hrs	0 days	Tue 8/6/02	Tue 10/29/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PhysicistF	50%	$0	$0	$0	$0
16	PostDocU	200%	$0	$0	$0	$0

Notes

Labor:
Tests are continued at LBL and
begun at FNAL at this point.
FNAL labor is 50% postdoc to verify Hybrids operate before module construction begins.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.3.1.1.8	Hybrid #2: Layout	$0	0	0

Notes

General:
This is a 2nd run of prototype hybrids. We would wave this option if the first round of chips+hybrids is working reasonably well.
Schedule:
Hybrid #2 is meant to be used with 2nd round of chips.
Labor:
Cost of the layout (CAD etc.) is in the manufacturing cost.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.3.1.1.9	Hybrid #2: Submission	$0	0	0
1.1.1.3.1.1.10	Hybrid #2: manufacturing	$87,993	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
2	FNALR&D	0%	0 hrs	0 days	Tue 1/21/03	Tue 1/21/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	$87,993	$0	$0	$87,993

Notes

General:

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Hybrid #2: manufacturing" continued

Notes

This is a contingency run in case the first hybrid run has major flaws, or modifications occured to the chip from first to second engineering run which requires hybrid modifications.
Cost:
see "Hybrid#1: manufacturing"

1.1.1.3.1.1.11	Hybrid #2 ready for chips	$0	0	0

Notes

Schedule:
This is 10 days after receiving hybrids to allow for some minimal test.

1.1.1.3.1.1.12	Hybrid #2 available	$0	0	0

Notes

Available means chips are already mounted bonded and tested with the hybrids.
Schedule:
We are assuming this will be 2 weeks after substrate are available (test and load the substrate) and 1 week after chips are available (for mounting, bonding and testing).

1.1.1.3.1.1.13	Hybrid #2: Evaluation	$0	0	0.5

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*
7	*PhysicistF*	*50%*	*200 hrs*	*0 days*	*Wed 4/30/03*	*Thu 7/10/03*
16	*PostDocU*	*150%*	*600 hrs*	*0 days*	*Wed 4/30/03*	*Thu 7/10/03*

ID	*Resource Name*	*Units*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
7	*PhysicistF*	*50%*	*$0*	*$0*	*$0*	*$0*
16	*PostDocU*	*150%*	*$0*	*$0*	*$0*	*$0*

Notes

Labor:
Test are done at LBL (no FNAL labor)
No labor cost for FNAL.
Total non FNAL Labor is estimated to be 2 full time physicists for prototype hybrid testing.

1.1.1.3.1.1.14	Hybrid assembly and evaluation at LBL	$0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*
7	*PhysicistF*	*50%*	*4 hrs*	*0 days*	*Tue 7/23/02*	*Tue 7/23/02*
16	*PostDocU*	*150%*	*12 hrs*	*0 days*	*Tue 7/23/02*	*Tue 7/23/02*

ID	*Resource Name*	*Units*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
7	*PhysicistF*	*50%*	*$0*	*$0*	*$0*	*$0*
16	*PostDocU*	*150%*	*$0*	*$0*	*$0*	*$0*

Notes

Labor:
Test are done at LBL (no FNAL labor)

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Hybrid assembly and evaluation at LBL" continued

Notes

No labor cost for FNAL.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.3.1.2	**Hybrid Preproduction**	**$313,264**	**0**	**0**
1.1.1.3.1.2.1	Preproduction hybrid: Layout	$0	0	0

Notes

Labor:
Cost of the layout (CAD etc.) is in the manufacturing cost.

1.1.1.3.1.2.2	Preproduction Hybrid: Submission	$0	0	0
1.1.1.3.1.2.3	Preproduction hybrid: manufacturing	$151,802	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
18	MANDSPASS	151,802	151,802	0 days	Fri 7/11/03	Fri 10/3/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
18	MANDSPASS	151,802	$151,802	$0	$0	$151,802

Notes

Schedule:
This has to cover stave production ramp up time.
Preproduction parts should be enough for building ~24 staves = 144 hybrids.
We assume to sustain a rate of 2 staves/week during preproduction (1 stave/day during production).
Cost:
Based on "cost for phase 2: preproduction phase"

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Preproduction hybrid: manufacturing" continued

Notes

V6.0 Mar-24-2002 (C.Haber, LBL)
Total cost is $151,802. Includes yield, labor, overhead, test cards and tests

1.1.1.3.1.2.4	Preproduction Hybrid ready for chips	$0	0	0

Notes

This is 40 (manufacturing)+10 (testing and loading) days after submission as a possible first batch of the pre-production.

1.1.1.3.1.2.5	Preproduction Hybrid Available	$0	0	0

Notes

Schedule:
1 month after chip evaluation begins at LBL production chips are available to be mounted on hybrids
2 weeks for mounting and testing the hybrid.

1.1.1.3.1.2.6	Preproduction Hybrid complete	$0	0	0

Notes

This assumes 10 hybrids delivered to Fermilab per week,
180 hybrids = 90 days of loading and testing

1.1.1.3.1.2.7	Setup Hybrid test stand	$161,462	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish
18	MANDSPASS	161,462	161,462	0 days	Wed 2/19/03	Wed 6/11/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
18	MANDSPASS	161,462	$161,462	$0	$0	$161,462

Notes

General:
This is the equipment at LBL and UC Davis for testing and burn-in of the hybrids.
It is mostly an update of the existing equipment.
Schedule:
Needs to be completed and in place by the time preproduction hybrids are ready to be tested
Cost:
LBL upgrade costs are handled by LBL with local funds.
UC Davis costs are based on D.Pellet cost estimate of July 2 2002.
Total is 161,462 and includes labor(90,700) , material and services (60,762).

1.1.1.3.1.2.8	Preproduction Hybrid: Testing training	$0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish
16	PostDocU	300%	1,920 hrs	0 days	Thu 6/12/03	Fri 10/3/03

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Preproduction Hybrid: Testing training " continued

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	PostDocU	300%	$0	$0	$0	$0

Notes

Schedule get setup for preproduction testing by training people on prototype parts.
Preproduction will require 6 FTE of university personnel. Here we assume 2/3 of that.
Labor:
This is handled at LBL and UC Davis with contributions from other institutions partecipating in the project. No labor cost for FNAL.

1.1.1.3.1.2.9 Preproduction Hybrid: Testing $0 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish
16	PostDocU	300%	1,416 hrs	0 days	Mon 10/6/03	Fri 1/2/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	PostDocU	300%	$0	$0	$0	$0

Notes

Schedule:
For this task we assume the 3 trained FTEs will work quickly to get the initial hybrids tested and
ready for modules and staves.
We need to sustain a rate of 8 hybrids/week to sustain the preproduction module production rate of 1.5 modules/day.
The next task adds additional personnel for training to ramp up to a speed of 40/week in production.
For preproduction we assume a to ramp up to maximum rate of
rate of 18 hybrids/week.
144 hybrids to test:
This task assumes an average of 9 tested/week (108 hybrids tested in 12 weeks)
The next task, with twice the people assmes the remaining 36 hybrids are tested in 8 weeks to include the training time.

In production the rate is 40/week.
Labor:
This is handled at LBL and UC Davis with contributions from other institutions partecipating in the project. No labor cost for FNAL.
Total non FNAL Labor is estimated to be 6 full time physicists for production hybrid testing.

1.1.1.3.1.2.10 Preproduction Hybrid: Testing $0 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish
16	PostDocU	600%	1,872 hrs	0 days	Wed 1/14/04	Tue 3/9/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	PostDocU	600%	$0	$0	$0	$0

1.1.1.3.1.3 Hybrid Production $966,408 0 0

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.3.1.3.1	Production Hybrid: layout	$0	0	0

Notes

General:
This task is contingency.
Labor:
Cost of the layout (CAD etc.) is in the manufacturing cost.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.3.1.3.2	Production Hybrid Go-ahead	$0	0	0

Notes

Schedule:
We need enough time to evaluate the preproduction (we put 40 days = 2 months).
Also we need some time to test the preproduction DAQ chain before committing to the production.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.3.1.3.3	Production Hybrid: manufacturing	$483,204	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
18	MANDSPASS	483,204	483,204	0 days	Wed 1/14/04	Tue 6/1/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
18	MANDSPASS	483,204	$483,204	$0	$0	$483,204

Notes

General:
Quantitiy needed is 1,080 + spares = 1200 hybrids.
Cost:
Based on "Production cost for CDF Run2b Hybrids & stave bus"
V3.0 Mar-24-2002 (C.Haber, LBL)
Total cost is $966,408. Includes yield, labor, overhead, test cards and tests

The cost is split into two orders to reflect better the availability of funds.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.3.1.3.4	production hybrid 2nd half of money	$483,204	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	483,204	483,204	0 days	Thu 6/3/04	Thu 6/3/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	483,204	$483,204	$0	$0	$483,204

Notes

This is second payment on the prodction hybrid order.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.3.1.3.5	Production Hybrid: testing	$0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish
16	PostDocU	600%	7,200 hrs	0 days	Wed 4/7/04	Fri 11/5/04

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Production Hybrid: testing" continued

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	PostDocU	600%	$0	$0	$0	$0

Notes

Schedule:
The lag time for starting this task assumes 40 days for completion of the first batch of substrate manufacturing plus a month (20days) for loading and testing and setup time.
We need to sustain a rate of 40/week (=8/day) delivered to Fermilab.
We assume production is 1200 hybrids = 150 days of loading and testing.
Labor:
This is handled at LBL and UC Davis with contributions from other institutions partecipating in the project. No labor cost for FNAL.
Total non FNAL Labor is estimated to be 6 full time physicists for hybrid testing.

1.1.1.3.1.3.6	Production Hybrids Available	$0	0	0

Notes

This assumes the first hybrids are fully tested and shipped to FNAL 5 days after testing has started.

1.1.1.3.1.3.7	Hybrid Production Complete	$0	0	0
1.1.1.3.2	**Layer 0**	**$200,734**	**0**	**0**

Notes

Runs:
1. Prototype
2. Production

Need **72** 2-chips hybrids.

1.1.1.3.2.1	**Hybrid Layer 0 Prototype**	**$62,385**	**0**	**0**
1.1.1.3.2.1.1	Prototype#1 L0 hybrid: Layout	$0	0	0

Notes

Schedule:
Layout can start as soon as the first outer layer hybrid has been submitted for fabrication.
Labor:
Costed in the manufacturing.

1.1.1.3.2.1.2	Prototype#1 L0 hybrid: Submission	$0	0	0
1.1.1.3.2.1.3	Prototype#1 L0 hybrid: manufacturing	$62,385	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
2	FNALR&D	0%	0 hrs	0 days	Tue 9/24/02	Tue 9/24/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	$62,385	$0	$0	$62,385

Notes

General:

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Prototype#1 L0 hybrid: manufacturing" continued

Notes

72 needed for entire production. Fabricate 25 working L0 hybrids prototypes.
Cost:
Estimated from LBL Hybri-L0-costs (06/15/2002).
contingency is 30%

1.1.1.3.2.1.4	Prototype#1 L0 hybrid Available	$0	0	0

Notes

Schedule:
This is 20 days after substrates are available (for mounting and testing).
This order could cover the full production.
These hybrids are meant to be using 2nd round of chip.

1.1.1.3.2.1.5	Prototype#1 L0 hybrid: evaluation	$0	0	0.5

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*
16	*PostDocU*	*100%*	*312 hrs*	*0 days*	*Wed 1/15/03*	*Tue 3/11/03*

ID	*Resource Name*	*Units*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
16	*PostDocU*	*100%*	*$0*	*$0*	*$0*	*$0*

Notes

Labor:
LBL labor only (no FNAL effort)

1.1.1.3.2.2	**Hybrid L0 production**	**$138,349**	**0**	**0**
1.1.1.3.2.2.1	Production L0 Hybrid: final layout	$0	0	0

Notes

Labor:
Labor cost included in the manufacturing

1.1.1.3.2.2.2	Production L0 Hybrid Submission	$0	0	0
1.1.1.3.2.2.3	Production L0 hybrid: manufacturing	$138,349	0.5	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*
18	*MANDSPASS*	*138,349*	*138,349*	*0 days*	*Wed 5/21/03*	*Thu 7/31/03*

ID	*Resource Name*	*Units*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
18	*MANDSPASS*	*138,349*	*$138,349*	*$0*	*$0*	*$138,349*

Notes

Cost:
Estimated from "Hybrid-L0-costs" (06/15/2002)
Total cost is $138,349.
Includes yield, labor, spares, overhead and tests

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.3.2.2.4	Production L0 hybrid available	$0	0	0
1.1.1.3.2.2.5	Production L0 hybrid complete	$0	0	0
1.1.1.4	**Bus Cables**	**$41,001**	**0**	**0**

Notes

Outer layer Bus cable is a Kapton based cable with signal and power traces to electrically connect the mini-PC to the hybrids. It also provides a ground shield plate to minimise noise pick-up from the sensors and the sensor bias connection.

Runs:
1. Prototype (milestone #1 "electrical stave test")
2. Preproduction (milestone #3 "Preproduction electrical stave test")
3. Production (milestone #4 "Production electrical stave test")

Need **360** bus cables for the 180 staves installed.
We will construct 200 Staves to include 20 spares and thus will need 400 Bus cables

Labor:
All LBL labor. No FNAL efforts for the Bus Cable

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.4.1	**Bus Cable Prototype**	**$2,385**	**0**	**0**
1.1.1.4.1.1	Prototype#1 Bus Cable: specs, design and Layout	$0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
16	*PostDocU*	*100%*	*792 hrs*	*0 days*	*Fri 1/11/02*	*Fri 5/31/02*	*$0*	*$0*	*$0*	*$0*

Notes

Schedule:
Submission date coincides with the submission date for the hybrid. Hybrids take longer to fabricate, load and test.
Labor:
All labor is in LBL by physicists (no FNAL labor).

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.4.1.2	Prototype#1 Bus Cable Submission	$0	0	0
1.1.1.4.1.3	Prototype#1 Bus Cable: Manufacturing	$2,385	1	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
2	*FNALR&D*	*0%*	*0 hrs*	*0 days*	*Fri 5/31/02*	*Fri 5/31/02*	*$2,385*	*$0*	*$2,385*	*$0*

Notes

General:
We want 2 flavours of these cables (thinner and thicker shield plane)
in order to test the noise pick-up on the silicon.
Cost:
Based on "FY2002 development cost for CDF Run2b Hybrids & stave bus"
V6.0 Mar-24-2002 (C.Haber, LBL)
$2,385 for 20 parts (10 of each flavour). Includes overhead.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.4.1.4	Prototype #1 Mechanical Bus cables available	$0	0	0

WBS	Name	Cost	M&S Cont.	Labor Cont.
"Prototype #1 Mechanical Bus cables available" continued				
1.1.1.4.1.5	Prototype#1 Electrical Bus Cable available	$0	0	0
1.1.1.4.1.6	Prototype#1 Bus Cable: Evaluation	$0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish
16	PostDocU	50%	160 hrs	0 days	Tue 9/10/02	Mon 11/4/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	PostDocU	50%	$0	$0	$0	$0

Notes

Labor:
All labor is done at LBL (no FNAL labor).

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.4.2	**Bus Cable Preproduction and Production**	**$38,616**	**0**	**0**
1.1.1.4.2.1	Preproduction Bus Cable: layout	$0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish
16	PostDocU	50%	120 hrs	0 days	Thu 5/29/03	Thu 7/10/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	PostDocU	50%	$0	$0	$0	$0

Notes

Schedule:
Submission date coincides with the submission date for the preproduction hybrids. Hybrids take longer to fabricate, load and test.
Labor:
All labor is done at LBL (no FNAL labor).

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.4.2.2	Preproduction Bus Cable Submission	$0	0	0
1.1.1.4.2.3	Preproduction Bus Cable: manufacturing	$6,466	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
18	MANDSPASS	6,466	6,466	0 days	Fri 7/11/03	Fri 9/19/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
18	MANDSPASS	6,466	$6,466	$0	$0	$6,466

Notes

Cost:
Based on "FY2002 development cost for CDF Run2b Hybrids & stave bus"
V6.0 Mar-24-2002 (C.Haber, LBL)
$6,466 for 60 parts. Includes overhead.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.4.2.4	Preproduction Bus Cables available	$0	0	0

WBS	Name	Cost	M&S Cont.	Labor Cont.
"Preproduction Bus Cables available" continued				
1.1.1.4.2.5	Production Bus Cable: final design and layout	$0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish
16	PostDocU	50%	140 hrs	0 days	Mon 9/22/03	Fri 11/7/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	PostDocU	50%	$0	$0	$0	$0

Notes

Schedule:
Submission date coincides with the submission date for the preproduction hybrid. Hybrids take longer to fabricate, load and test.
This task is contingency.
Labor:
All labor is in LBL by physicists (no FNAL labor).

1.1.1.4.2.6	Production Bus Cable Submission	$0	0	0
1.1.1.4.2.7	Production Bus Cable: manufacturing	$32,150	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
18	MANDSPASS	32,150	32,150	0 days	Wed 1/14/04	Mon 4/5/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
18	MANDSPASS	32,150	$32,150	$0	$0	$32,150

Notes

Cost:
Based on "FY2002 development cost for CDF Run2b Hybrids & stave bus"
V6.0 Mar-24-2002 (C.Haber, LBL)
$32,150 for 400 parts. Includes overhead.

1.1.1.4.2.8	Production Bus cables available	$0	0	0
1.1.1.4.2.9	Production Bus Cables complete	$0	0	0
1.1.1.5	**Mini Port Card**	**$506,042**	**0**	**0**

Notes

The MPC is a BeO hybrid (2"x1.55"). Included in the miniportcards are:
1. components (including tranciever chips), connectors etc.
2. short kapton cables (2 cables, one for power and one for data)
3. cable wing (one kapton cable that connects the top MPC to the bottom stave bus cable)

Runs:
1. Prototype (milestone #1 "electrical stave test")
2. Contingency (milestone #2 "contingency electrical stave test")
3. Preproduction (milestone #3 "preproduction electrical stave test")
4. Production (milestone #4 "Production electrical stave test")

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Mini Port Card" continued

Notes

Need **180** Mini Port Cards for the project

1.1.1.5.1	**Mini Port Card Prototypes**	**$162,106**	**0**	**0**
1.1.1.5.1.1	Prototype#1 MPC: specs, design and layout	$35,676	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish
8	ElecEngF	50%	476 hrs	0 days	Mon 10/29/01	Thu 4/25/02
9	ElecTechF	50%	476 hrs	0 days	Mon 10/29/01	Thu 4/25/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	ElecEngF	50%	$24,252	$0	$24,252	$0
9	ElecTechF	50%	$11,424	$0	$11,424	$0

Notes

General:
Layout should finish together with the Hybrid#1 design.

1.1.1.5.1.2	Prototype#1 MPC submission	$0	0	0
1.1.1.5.1.3	Prototype#1 MPC: manufacturing	$45,522	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
2	FNALR&D	0%	0 hrs	0 days	Thu 4/25/02	Fri 6/28/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	$45,522	$0	$45,522	$0

Notes

General:
We need 10 mini-PC to sustain the stave prototype effort + test stand needs.
Cost:
- 1/31/2002 estimated cost is (quotation from CPT n. 1-1201-112)
- newer quotation (02/01/2002) :

1. 25 (minimum order) MPC @ 1,168.90 each
2. NRE 4,500.00
3. PigTail (2) 370.00 (per MPC) 185 each
4. cable wing 210.00 (per MPC)
3. miscellenea components 600.00 (per MPC)

45,522.50

We priced the "loading" of 10 MPCs as prototypes.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.5.1.4	Prototype#1 MPC: assembly and evaluation	$11,756	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
8	ElecEngF	25%	80 hrs	0 days	Wed 9/4/02	Tue 10/29/02
9	ElecTechF	100%	320 hrs	0 days	Wed 9/4/02	Tue 10/29/02
16	PostDocU	50%	160 hrs	0 days	Wed 9/4/02	Tue 10/29/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	ElecEngF	25%	$4,076	$0	$0	$4,076
9	ElecTechF	100%	$7,680	$0	$0	$7,680
16	PostDocU	50%	$0	$0	$0	$0

1.1.1.5.1.5	Prototype#1 MPC Available	$0	0	0

Notes

This has 10 days for assembly after recieving parts and 5 days (1week)
for testing and debugging.

1.1.1.5.1.6	Prototype#2 MPC: design and layout	$11,874	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
8	ElecEngF	50%	120 hrs	0 days	Wed 10/30/02	Thu 12/12/02
9	ElecTechF	100%	240 hrs	0 days	Wed 10/30/02	Thu 12/12/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	ElecEngF	50%	$6,114	$0	$0	$6,114
9	ElecTechF	100%	$5,760	$0	$0	$5,760

Notes

General:
This is a contingency run of MPCs. We would wave this option if the first round of chips+hybrids+MPC is working reasonably well. Cost goes all in the contingency.
Schedule:
Submission date is linked to the submission of the 2nd hybrid prototype.

1.1.1.5.1.7	Prototype#2 MPC Submission	$0	0	0
1.1.1.5.1.8	Prototype#2 MPC: manufacturing	$45,522	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
2	FNALR&D	0%	0 hrs	0 days	Tue 1/21/03	Tue 1/21/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	$45,522	$0	$0	$45,522

Notes

Cost:
same as for "Prototype#1 MPC: manufacturing".
All in Contingency.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.5.1.9	Prototype#2 MPC: assembly and evaluation	$11,756	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
8	ElecEngF	25%	80 hrs	0 days	Wed 4/2/03	Wed 5/28/03
9	ElecTechF	100%	320 hrs	0 days	Wed 4/2/03	Wed 5/28/03
16	PostDocU	50%	160 hrs	0 days	Wed 4/2/03	Wed 5/28/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	ElecEngF	25%	$4,076	$0	$0	$4,076
9	ElecTechF	100%	$7,680	$0	$0	$7,680
16	PostDocU	50%	$0	$0	$0	$0

1.1.1.5.1.10	Prototype#2 MPC Available	$0	0	0

Notes

This has 10 days for assembly after recieving parts and 5days
for testing.

1.1.1.5.2	**Mini Port Card Preproduction**	**$91,182**	**0**	**0**
1.1.1.5.2.1	Project Pacing: preproduction MPC	$0	0	0
1.1.1.5.2.2	Preproduction MPC: design and layout	$11,874	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
8	ElecEngF	50%	120 hrs	0 days	Wed 6/11/03	Wed 7/23/03
9	ElecTechF	100%	240 hrs	0 days	Wed 6/11/03	Wed 7/23/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	ElecEngF	50%	$6,114	$0	$0	$6,114
9	ElecTechF	100%	$5,760	$0	$0	$5,760

Notes

General:
Linked to the Preproduction hybrid layout.

1.1.1.5.2.3	Preproduction MPC Submission	$0	0	0
1.1.1.5.2.4	Preproduction MPC: manufacturing	$63,712	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	63,712	63,712	0 days	Thu 7/24/03	Thu 10/2/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	63,712	$63,712	$0	$0	$63,712

Notes

We order enough to sustain stave preproduction.
24 staves = 30 MPC including some spares and yield.
Cost:
30 MPC (same price as the prototypes)

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Preproduction MPC: manufacturing" continued

Notes

1. finished substrate	@ 1,168.90 (per MPC)
2. NRE	4,500.00
3. Pig Tails	3,895.00 (for 100 cables, 2 per MPC needed)
4. cable wing	2,250.00 (for 100 wings, 1 per MPC needed)
3. miscellenea components	600.00 (per MPC) includes testing cards
	---
	63,712.00

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.5.2.5	Preproduction MPC assembly and evaluation	$15,596	0	0.5

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*
8	*ElecEngF*	*25%*	*80 hrs*	*0 days*	*Fri 10/3/03*	*Mon 12/1/03*
9	*ElecTechF*	*150%*	*480 hrs*	*0 days*	*Fri 10/3/03*	*Mon 12/1/03*
16	*PostDocU*	*100%*	*320 hrs*	*0 days*	*Fri 10/3/03*	*Mon 12/1/03*

ID	*Resource Name*	*Units*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
8	*ElecEngF*	*25%*	*$4,076*	*$0*	*$0*	*$4,076*
9	*ElecTechF*	*150%*	*$11,520*	*$0*	*$0*	*$11,520*
16	*PostDocU*	*100%*	*$0*	*$0*	*$0*	*$0*

Notes

This assumes 40 days for producing first substrates plus 20 days for loading and testing. This should also coincide with preproduction hybrids available.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.5.2.6	Preproduction MPC Available	$0	0	0
1.1.1.5.3	**Mini Port Card Production**	**$252,754**	**0**	**0**
1.1.1.5.3.1	Production MPC: design and layout	$5,584	0	0.5

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*
8	*ElecEngF*	*25%*	*38 hrs*	*0 days*	*Mon 11/24/03*	*Mon 12/22/03*
9	*ElecTechF*	*100%*	*152 hrs*	*0 days*	*Mon 11/24/03*	*Mon 12/22/03*

ID	*Resource Name*	*Units*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
8	*ElecEngF*	*25%*	*$1,936*	*$0*	*$0*	*$1,936*
9	*ElecTechF*	*100%*	*$3,648*	*$0*	*$0*	*$3,648*

Notes

Schedule:
Linked to the production hybrid layout.
This task is contingency.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.5.3.2	Production MPC go ahead	$0	0	0

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.5.3.3	Production MPC: manufacturing	$208,180	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	208,180	208,180	0 days	Wed 1/14/04	Mon 5/3/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	208,180	$208,180	$0	$0	$208,180

Notes

Cost:
We need 180 + spares = 200 MPC:
Production price is (quotation from CPT 1-1201-112)
MPC @ 418.00 each
NRE @ 4,500.00
pigtails are 77.90 per MPC
wing is 22.50 per MPC
components is 500 per MPC (includes testing cards)
Total is 208,180 $

1.1.1.5.3.4	Production MPC available	$0	0	0

Notes

40days for production of first substrates and 20 days for
assembly and testing.

1.1.1.5.3.5	Production MPC: assembly and evaluation	$38,990	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
8	ElecEngF	25%	200 hrs	0 days	Wed 3/10/04	Thu 7/29/04
9	ElecTechF	150%	1,200 hrs	0 days	Wed 3/10/04	Thu 7/29/04
16	PostDocU	100%	800 hrs	0 days	Wed 3/10/04	Thu 7/29/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	ElecEngF	25%	$10,190	$0	$0	$10,190
9	ElecTechF	150%	$28,800	$0	$0	$28,800
16	PostDocU	100%	$0	$0	$0	$0

Notes

We need to sustain a rate of 1MPC/day or 5MPC/week.
It should be possible to load and test at least 2/day (10/week).
For production quantity of 200 MPC this is 100 days.

1.1.1.5.3.6	Production MPC complete	$0	0	0
1.1.1.6	**Junction Port Cards**	**$231,280**	**0**	**0**

Notes

The JPC is an FR4 board for signal and power distribution.
JPC includes:
1. components (capacitors, resistors, power filters, FPGA, connectors etc.)

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Junction Port Cards" continued

Notes

Runs:
1. Prototype#1 (milestone#1 "prototype electrical stave test")
2. Prototype#2 - contingency
2. Preproduction (milestone#3 "preproduction electrical stave test")
3. Production (milestone#4 "production electrical stave test")

Each port card can serve up to 5 mini-PC.
Total number of JPC for the project (inlcuding L0) is **56.**

Junction Port Cards

Layer	Φ-seg.	MPC (each side)	JPC (Total)
5	30	30	12
5	30		
4	24	24	10
4	24		
3	18	18	8
3	18		
2	12	12	6
2	12		
1	6	6	4
1	6		
0	12	0	16
Total JPC			56

1.1.1.6.1	**Junction Port Card Prototypes**	**$65,132**	**0**	**0**
1.1.1.6.1.1	JPC for milestone #1	$4,076	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*
8	*ElecEngF*	*25%*	*80 hrs*	*0 days*	*Mon 6/17/02*	*Mon 8/12/02*
16	*PostDocU*	*50%*	*160 hrs*	*0 days*	*Mon 6/17/02*	*Mon 8/12/02*

WBS	Name	Cost	M&S Cont.	Labor Cont.

"JPC for milestone #1" continued

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	ElecEngF	25%	$4,076	$0	$4,076	$0
16	PostDocU	50%	$0	$0	$0	$0

Notes

General:
This card is already done. It was developed for BTeV and can be used for the milestone #1.
Optionally we would like to have also the prototype #1 JPC ready for milestone #1 but it is not mandatory.
This JPC has the same functionality of the final JPC.
Labor:
This is to program the card (firmware).

1.1.1.6.1.2	Project Pacing: start JPC design	$0	0	0
1.1.1.6.1.3	Prototype#1 JPC: specs, design and layout	$11,874	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
8	ElecEngF	25%	120 hrs	0 days	Wed 10/30/02	Thu 1/30/03
9	ElecTechF	50%	240 hrs	0 days	Wed 10/30/02	Thu 1/30/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	ElecEngF	25%	$6,114	$0	$0	$6,114
9	ElecTechF	50%	$5,760	$0	$0	$5,760

Notes

Schedule:
linked to the end of the mini-PC evaluation

1.1.1.6.1.4	Prototype#1 JPC Submission	$0	0	0
1.1.1.6.1.5	Prototype#1 JPC: manufacturing	$9,000	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	0 hrs	0 days	Tue 2/4/03	Tue 2/4/03	$9,000	$0	$0	$9,000

Notes

Cost:
We need 5 for testing chips/hybrids/mpc/cables and staves
$800 each for the FR4 manufacturing (Engineering Estimate).
$1,000 each for miscellanea components (Engineering Estimate)
Total $9,000

1.1.1.6.1.6	Prototype#1 JPC: loading and testing	$4,672	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
8	ElecEngF	25%	38 hrs	0 days	Wed 3/5/03	Mon 3/31/03
9	ElecTechF	75%	114 hrs	0 days	Wed 3/5/03	Mon 3/31/03

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Prototype#1 JPC: loading and testing" continued

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	ElecEngF	25%	$1,936	$0	$0	$1,936
9	ElecTechF	75%	$2,736	$0	$0	$2,736

Notes

Labor:
loading and testing done at FNAL

1.1.1.6.1.7	Prototype#1 JPC Available	$0	0	0	

Notes

This is the 1st real prototype JPC. It will tested with the 2nd round of the hybrids and staves.

1.1.1.6.1.8	Prototype#1JPC: evaluation	$8,844	0	0.5	

ID	Resource Name	Units	Work	Delay	Start	Finish
8	ElecEngF	25%	118 hrs	0 days	Wed 4/2/03	Tue 6/24/03
9	ElecTechF	25%	118 hrs	0 days	Wed 4/2/03	Tue 6/24/03
16	PostDocU	25%	118 hrs	0 days	Wed 4/2/03	Tue 6/24/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	ElecEngF	25%	$6,012	$0	$0	$6,012
9	ElecTechF	25%	$2,832	$0	$0	$2,832
16	PostDocU	25%	$0	$0	$0	$0

Notes

Noise and DAQ chain compatibility tests.

1.1.1.6.1.9	Prototype#2 JPC: design and layout	$6,752	0	0.5	

ID	Resource Name	Units	Work	Delay	Start	Finish
8	ElecEngF	50%	76 hrs	0 days	Thu 6/26/03	Wed 7/23/03
9	ElecTechF	50%	120 hrs	0 days	Thu 6/26/03	Thu 8/7/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	ElecEngF	50%	$3,872	$0	$0	$3,872
9	ElecTechF	50%	$2,880	$0	$0	$2,880

Notes

General:
This is a 2nd run of prototype JPCs. We would wave this option if the first round of chips+hybrids+MPC+JPC is working reasonably well.
Labor:
as for the 1st prototype

1.1.1.6.1.10	Prototype#2 JPC Submission	$0	0	0	

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.6.1.11	Prototype#2 JPC: manufacturing	$9,000	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	0 hrs	0 days	Thu 8/7/03	Thu 8/7/03	$9,000	$0	$0	$9,000

Notes

Cost:
We need 5 for testing chips/hybrids/mpc/cables and staves
$800 each for the FR4 manufacturing (Engineering Estimate).
$1,000 each for miscellanea components (Engineering Estimate)
Total $9,000.

1.1.1.6.1.12	Prototype#2 JPC: loading and testing	$4,918	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
8	ElecEngF	25%	40 hrs	0 days	Mon 9/8/03	Fri 10/3/03
9	ElecTechF	75%	120 hrs	0 days	Mon 9/8/03	Fri 10/3/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	ElecEngF	25%	$2,038	$0	$0	$2,038
9	ElecTechF	75%	$2,880	$0	$0	$2,880

Notes

Labor:
Loading and testing done at FNAL

1.1.1.6.1.13	Prototype#2 JPC Available	$0	0	0

Notes

1.1.1.6.1.14	Prototype#2: JPC evaluation	$5,996	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
8	ElecEngF	25%	80 hrs	0 days	Mon 10/6/03	Tue 12/2/03
9	ElecTechF	25%	80 hrs	0 days	Mon 10/6/03	Tue 12/2/03
16	PostDocU	25%	80 hrs	0 days	Mon 10/6/03	Tue 12/2/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	ElecEngF	25%	$4,076	$0	$0	$4,076
9	ElecTechF	25%	$1,920	$0	$0	$1,920
16	PostDocU	25%	$0	$0	$0	$0

1.1.1.6.2	**Junction Portcard Preproduction**	**$49,708**	**0**	**0**
1.1.1.6.2.1	Preproduction JPC: design and layout	$11,692	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
8	ElecEngF	50%	156 hrs	0 days	Wed 1/14/04	Tue 3/9/04
9	ElecTechF	50%	156 hrs	0 days	Wed 1/14/04	Tue 3/9/04

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Preproduction JPC: design and layout" continued

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	ElecEngF	50%	$7,948	$0	$0	$7,948
9	ElecTechF	50%	$3,744	$0	$0	$3,744

Notes

Schedule:
Linked to the MPC preproduction.

1.1.1.6.2.2	Preproduction JPC Submission	$0	0	0
1.1.1.6.2.3	Preproduction JPC: manufacturing	$25,500	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	25,500	25,500	0 days	Wed 3/10/04	Tue 4/6/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	25,500	$25,500	$0	$0	$25,500

Notes

General:
We need 10 (preproduction)+5 for testing setups including spares.
Cost:
$600 each for FR4 boards
$1,100 each for components and loading and testing (Engineering Estimate).

1.1.1.6.2.4	Preproduction JPC: assembly	$3,000	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	3,000	3,000	0 days	Wed 4/14/04	Tue 5/11/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	3,000	$3,000	$0	$0	$3,000

Notes

Done on an outside company.
Estimated cost is $200.00/JPC

1.1.1.6.2.5	Preproduction JPC: testing	$4,672	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
8	ElecEngF	25%	38 hrs	0 days	Wed 4/21/04	Mon 5/17/04
9	ElecTechF	75%	114 hrs	0 days	Wed 4/21/04	Mon 5/17/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	ElecEngF	25%	$1,936	$0	$0	$1,936
9	ElecTechF	75%	$2,736	$0	$0	$2,736

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Preproduction JPC: testing" continued

Notes

Testing done at FNAL.
Labor:
1. Electrical Eng. (25%) support
2. Electrical Tech (75%) testing

1.1.1.6.2.6	Preproduction JPC available	$0	0	0

Notes

Lag time of 20days for loading and testing.

1.1.1.6.2.7	Preproduction JPC: evaluation	$4,844	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
8	ElecEngF	25%	80 hrs	0 days	Wed 5/12/04	Thu 7/8/04
9	ElecTechF	10%	32 hrs	0 days	Wed 5/12/04	Thu 7/8/04
16	PostDocU	75%	240 hrs	0 days	Wed 5/12/04	Thu 7/8/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	ElecEngF	25%	$4,076	$0	$0	$4,076
9	ElecTechF	10%	$768	$0	$0	$768
16	PostDocU	75%	$0	$0	$0	$0

1.1.1.6.3	**Junction Portcard Production**	**$116,439**	**0**	**0**
1.1.1.6.3.1	Production JPC: design and layout	$2,038	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	ElecEngF	25%	40 hrs	0 days	Fri 7/9/04	Thu 8/5/04	$2,038	$0	$0	$2,038
16	PostDocU	50%	80 hrs	0 days	Fri 7/9/04	Thu 8/5/04	$0	$0	$0	$0

Notes

Schedule:
Linked to the MPC production layout.
This task is contingency.

1.1.1.6.3.2	Production JPC go ahead	$0	0	0
1.1.1.6.3.3	Production JPC: manufacturing	$102,000	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	102,000	102,000	0 days	Fri 8/6/04	Thu 9/2/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	102,000	$102,000	$0	$0	$102,000

Notes

General:
We need 52 working boards + spares = 60 boards (15 have been made already during pre-production).

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Production JPC: manufacturing" continued

Notes

Cost:
$600 each for FR4 substrate (Engineering Estimate)
$1,100 each for components, loading and testing (Engineering Estimate).
Total is $1,700 per JPC.
Total $102,000

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.6.3.4	Preproduction JPC: assembly	$1,500	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	1,500	1,500	0 days	Mon 9/13/04	Fri 10/22/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	1,500	$1,500	$0	$0	$1,500

Notes

Done on an outside company.
Estimated cost is $200.00/JPC

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.6.3.5	Production JPC: testing	$10,901	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
8	ElecEngF	10%	47.2 hrs	0 days	Fri 8/13/04	Thu 11/4/04
9	ElecTechF	75%	354 hrs	0 days	Fri 8/13/04	Thu 11/4/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	ElecEngF	10%	$2,405	$0	$0	$2,405
9	ElecTechF	75%	$8,496	$0	$0	$8,496

Notes

Labor:
Loading and basic testing done on a outside company.
This is FNAL labor for more extensive testing of the card.
Schedule:
we should test 1 board/day.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.6.3.6	Production JPC Available	$0	0	0

Notes

Schedule:
Lag time of 40 days includes 20d for getting the first boards tested.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.6.3.7	Production JPC Complete	$0	0	0

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.7	**Cables**	**$322,956**	**0**	**0**

Notes

We will replace all cables going from the silicon detector to the DAQ and Power Supplies racks.
There are 2 sets of these cables:

- from the mini Port Card (end of stave) to the Junction Port Card
- from the Junction Port Card to the racks.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.7.1	**Cables from MPC to JPC**	**$194,396**	**0**	**0**

Notes

These are in reality 2 sets of cables.
One set from the end of the MPC pig-tail to the Junction card (signal + power) and a second set from the Junction card to the Junction Portcard (signal + power).
First set is about 3 feet long
Second set is about 9 feet long.
The Junction Card connects the 2 sets.
In production we will need 180*2 = **360** sets of cables.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.7.1.1	**Cables from MPC to JPC: Prototypes**	**$7,036**	**0**	**0**
1.1.1.7.1.1.1	Finalize cables and connectors for milestone#1	$4,076	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	*PhysicistF*	*50%*	*160 hrs*	*0 days*	*Fri 3/8/02*	*Thu 5/2/02*	*$0*	*$0*	*$0*	*$0*
8	*ElecEngF*	*25%*	*80 hrs*	*0 days*	*Fri 3/8/02*	*Thu 5/2/02*	*$4,076*	*$0*	*$4,076*	*$0*

Notes

These are not the same cables we will use in the final version since for milestone #1 we are not using the JPC necessarely.

1.1.1.7.1.1.2	Procure cables for milestone#1	$2,000	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	*FNALR&D*	*0%*	*0 hrs*	*0 days*	*Thu 5/2/02*	*Thu 5/2/02*	*$2,000*	*$0*	*$2,000*	*$0*

Notes

These are not necessarely the cables from the MPC to the JPC since the JPC may not be part of milestone#1. These are just "functional cables" for milestone #1
Need 2 sets (4m long) with connectors for testing staves for milestone#1
Cost:
$1,000 per set (Engineering Estimate)
Total $2,000

1.1.1.7.1.1.3	cable testing for milestone #1	$960	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
9	*ElecTechF*	*25%*	*40 hrs*	*0 days*	*Mon 7/1/02*	*Mon 7/29/02*

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	*ElecTechF*	*25%*	*$960*	*$0*	*$960*	*$0*

1.1.1.7.1.1.4	MPC-JPC Cables available for milestone#1	$0	0	0

WBS	Name	Cost	M&S Cont.	Labor Cont.
"MPC-JPC Cables available for milestone#1" continued				
1.1.1.7.1.2	**Cables from MPC to JPC: Production**	**$187,360**	**0**	**0**
1.1.1.7.1.2.1	Finalize production cables and connectors	$5,996	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
8	ElecEngF	25%	80 hrs	0 days	Thu 5/29/03	Thu 7/24/03
9	ElecTechF	25%	80 hrs	0 days	Thu 5/29/03	Thu 7/24/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	ElecEngF	25%	$4,076	$0	$0	$4,076
9	ElecTechF	25%	$1,920	$0	$0	$1,920

Notes

Schedule:
After the first DAQ chain has been tested, we can finilize the cables and connectors.
These are now the prototype/preproduction cables.

1.1.1.7.1.2.2	MPC-JPC Production Cables and Connectors Finalized	$0	0	0
1.1.1.7.1.2.3	Preproduction MPC-JPC cables: procure	$12,891	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	12,891	12,891	0 days	Fri 7/25/03	Fri 9/19/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	12,891	$12,891	$0	$0	$12,891

Notes

Cost:
Production costs is (test will be done at FNAL):
a set consists of all cables serving 1 stave.
quotation New England Wire n. 00128434 (06/04/02) [Signal Cable]
quotation New England Wire n. 00128835 (06/17/02) [High Voltage]
quotation XXX [Power Cable]
quotation Omnetics n.Q0417201 (04/17/02) [connectors+termination+labor]
SET:
1. signal cable (MPC to JC) $ 7.711 per foot (3')
   cable terminations $141.39
2. signal cable (MPC to JC) $ 7.711 per foot (12')
   cable terminations $141.39
3. HV cable (MPC to JC) $ 2.549 per foot (3')
   cable terminations $42 (?)
4. HV cable (MPC to JC) $ 2.549 per foot (12')
   cable terminations $42 (?)
5. Power cable (MPC to JC) $30.0 per cable (includes termination, labor and connectors)
6. Power cable (JC to JPC) $40.0 per cable (includes termination, labor and connectors)

Total cost is (180 sets needed + spares = 200):
30 *((12'+3')*7.711 + 366.78 + 70) = 30*552.5 = **$ 16,575**

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Preproduction MPC-JPC cables: procure" continued

Notes

Contingency is 50% pending radiation hardness understanding of some standard cable insulation.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.7.1.2.4	Preproduction MPC-JPC cable: testing	$4,960	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
9	ElecTechF	25%	40 hrs	0 days	Mon 9/22/03	Fri 10/17/03
17	MANDS	4,000	4,000	0 days	Mon 9/22/03	Fri 10/17/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	ElecTechF	25%	$960	$0	$0	$960
17	MANDS	4,000	$4,000	$0	$0	$4,000

Notes

Labor:
Termination and testing will be done at the company. Here is just considered the final check at FNAL.
We estimate ~1hr. per set.
We will build (or purchaise) a test box for the cables.
Estimated cost is $4,000 (engineering estimate)

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.7.1.2.5	MPC-JPC preproduction cables available	$0	0	0
1.1.1.7.1.2.6	Project Pacing: Order cables from MPC-JPC	$0	0	0
1.1.1.7.1.2.7	Production go ahead on MPC -JPC cables	$0	0	0

Notes

Schedule:
linked to the test on the preproduction DAQ chain.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.7.1.2.8	Production MPC-JPC cables: procure	$155,833	0.5	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
9	ElecTechF	10%	47.2 hrs	0 days	Wed 5/5/04	Wed 7/28/04
17	MANDS	154,700	154,700	0 days	Wed 5/5/04	Thu 7/29/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	ElecTechF	10%	$1,133	$0	$0	$1,133
17	MANDS	154,700	$154,700	$0	$0	$154,700

Notes

Cost:
Production costs is (test will be done at FNAL):
a set consists of all cables serving 1 stave.
quotation New England Wire n. 00128434 (06/04/02) [Signal Cable]
quotation New England Wire n. 00128835 (06/17/02) [High Voltage]
quotation XXX [Power Cable]
quotation Omnetics n.Q0417201 (04/17/02) [connectors+termination+labor]

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Production MPC-JPC cables: procure" continued

Notes

SET:
1. signal cable (MPC to JC) $ 7.711 per foot (3')
   cable terminations $141.39
2. signal cable (JC to JPC) $ 7.711 per foot (12')
   cable terminations $141.39
3. HV cable (MPC to JC) $ 2.549 per foot (3')
   cable terminations $42 (?)
4. HV cable (JC to JPC) $ 2.549 per foot (12')
   cable terminations $42 (?)
5. Power cable (MPC to JC) $30.0 per cable (includes termination, labor and connectors)
6. Power cable (JC to JPC) $40.0 per cable (includes termination, labor and connectors)

Total cost is (180 sets needed + spares = 200):
252 *((12'+3')*7.711 + 366.78 + 70) = (252+spares=280)*552.5 = **$ 154,700**

Contingency is 50% pending radiation hardness understanding of some standard cable insulation.
Labor:
1. Electrical Tech. (10%) contact with the cable manufacturing company.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.7.1.2.9	Production MPC-JPC cable: testing	$7,680	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
9	ElecTechF	50%	320 hrs	0 days	Thu 7/1/04	Fri 10/22/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	ElecTechF	50%	$7,680	$0	$0	$7,680

Notes

Labor:
Basic tests will be done by the manufacturer. At FNAL just the final tests prior to installation.
Schedule:
We expect the 1st batch of cables to arrive 40 days after the order is placed.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.7.1.2.10	MPC-JPC production cables available	$0	0	0
1.1.1.7.1.2.11	Production cables complete	$0	0	0

Notes

We need 200 sets for the detector.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.7.2	**Cables from JPC to Crates**	**$128,560**	**0**	**0**

Notes

There are 4 types of cable:
1. signal (JPC to FTM/FIB)
2. power (JPC to Power Supply)
3. High Voltage (JPC to Power Supply)

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Cables from JPC to Crates" continued

Notes

4. sensing wire for the LV power (JPC to Power Supply)
The High Voltage cable and sense cable could be the same as the Power cable (all going to Power Supplies).
Total length is about 60 feet.

1.1.1.7.2.1	**Cables from JPC to crates: prototypes**	**$10,036**	**0**	**0**
1.1.1.7.2.1.1	Finalize cables and connectors for milestone #1	$4,076	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PhysicistF	50%	160 hrs	0 days	Fri 3/8/02	Thu 5/2/02	$0	$0	$0	$0
8	ElecEngF	25%	80 hrs	0 days	Fri 3/8/02	Thu 5/2/02	$4,076	$0	$4,076	$0

Notes

Schedule:
linked to milestone #1. These are not the final cables, just same functionality

1.1.1.7.2.1.2	Procure cables for milestone #1	$5,000	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	0 hrs	0 days	Fri 5/3/02	Fri 5/3/02	$5,000	$0	$5,000	$0

Notes

Need 5 sets with connectors for milestone #1
Cost:
$1,000 per set (Engineering Estimate)
Total $5,000

1.1.1.7.2.1.3	cable testing for milestone #1	$960	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish
9	ElecTechF	50%	40 hrs	0 days	Mon 7/1/02	Mon 7/15/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	ElecTechF	50%	$960	$0	$960	$0

Notes

Labor:
This is for terminating cables and testing.

1.1.1.7.2.1.4	JPC-Crates cables available for milestone #1	$0	0	0
1.1.1.7.2.2	**Cables from JPC to crates: Production**	**$118,524**	**0**	**0**
1.1.1.7.2.2.1	Finalize production cables and connectors	$8,844	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
7	PhysicistF	25%	118 hrs	0 days	Wed 1/22/03	Mon 4/14/03
8	ElecEngF	25%	118 hrs	0 days	Wed 1/22/03	Mon 4/14/03

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Finalize production cables and connectors" continued

ID	Resource Name	Units	Work	Delay	Start	Finish
9	ElecTechF	25%	118 hrs	0 days	Wed 1/22/03	Mon 4/14/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PhysicistF	25%	$0	$0	$0	$0
8	ElecEngF	25%	$6,012	$0	$0	$6,012
9	ElecTechF	25%	$2,832	$0	$0	$2,832

Notes

Schedule:
After the first DAQ chain has been tested, we can finilize the cables and connectors.
These are now the prototype/preproduction cables.

1.1.1.7.2.2.2	JPC-Crates Production Cables Finilized	$0	0	0

1.1.1.7.2.2.3	Preproduction JPC-crates cables: procure	$10,500	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	10,500	10,500	0 days	Wed 4/16/03	Wed 6/11/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	10,500	$10,500	$0	$0	$10,500

Notes

These are prototype/preproduction cables to be used fro the preproduction milestone.
Cost:
Based on the price of the IIa project.
Cost includes terminated cables + connectors + Labor.
We assume here all separate cables.
Need 5 sets for preproduction + 2 spare = 7 sets
6 cables for signals (5 data, 1 is control and clocks), $170*6 = $1,020 per JPC
1 cable for HV, $50 per JPC
1 cable for power $260 per JPC
1 cable for sensing $170 per JPC

Total is $1,500 per JPC set. With 7 sets we have 10.5 K$

1.1.1.7.2.2.4	Preproduction JPC-crates cable: testing	$1,920	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
9	ElecTechF	50%	80 hrs	0 days	Thu 6/12/03	Thu 7/10/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	ElecTechF	50%	$1,920	$0	$0	$1,920

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Preproduction JPC-crates cable: testing" continued

Notes

Labor:
this is just for testing cables (no termination required)

1.1.1.7.2.2.5	Preproduction JPC-Crates cables available	$0	0	0
1.1.1.7.2.2.6	Project pacing: Order Cables for JPC-Crate	$0	0	0
1.1.1.7.2.2.7	Production go ahead on JPC-Crates cables	$0	0	0
1.1.1.7.2.2.8	Production JPC-crates cables: procurement	$91,500	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	91,500	91,500	0 days	Wed 5/5/04	Thu 7/29/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	91,500	$91,500	$0	$0	$91,500

Notes

Cost:
We need on set of cables per JPC - Need 56 sets of these cables.

Cost:
Price estimated from the IIa project:
Price includes terminated cables + connectors + Labor.
6 cables for signals (5 data, 1 is control and clocks), $170*6 = $1,020 per JPC
1 cable for HV, $50 ??? per JPC
1 cable for power $260 per JPC
1 cable for sensing $170 per JPC

Total is $1,500 per JPC. With 56 (needed) + 5 spares we have 91.5 K$

1.1.1.7.2.2.9	Production JPC-crates cables: testing	$5,760	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
9	ElecTechF	50%	240 hrs	0 days	Thu 7/1/04	Fri 9/24/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	ElecTechF	50%	$5,760	$0	$0	$5,760

Notes

Labor:
this is just for testing cables (no termination required)

1.1.1.7.2.2.10	Production JPC cables available	$0	0	0

WBS	Name	Cost	M&S Cont.	Labor Cont.
"Production JPC cables available" continued				
1.1.1.7.2.2.11	Production JPC cables complete	$0	0	0
1.1.1.8	**Fiber Transition Module Replacements**	**$242,578**	**0**	**0**

Notes

New boards are needed to replace the Fiber Transistion Modules (FTMs) because
we are not using optical transmitter/receivers for the data.
Here we estimate the price of making the new cards.
There are 56 JPC's installed the project.
There is one FTM every 2 JPC = 28 FTMs.
We need to have spares and extra boards for test stands: need 37 total FTMs.

Runs:
1. Prototype
3. Production

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.8.1	**FTM Prototypes**	**$40,252**	**0**	**0**
1.1.1.8.1.1	modify existing FTM for milestone #1	$408	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	ElecEngF	5%	8 hrs	0 days	Fri 4/5/02	Thu 5/2/02	$408	$0	$408	$0
16	PostDocU	25%	40 hrs	0 days	Fri 4/5/02	Thu 5/2/02	$0	$0	$0	$0

Notes

General:
this is just a modification of one existing FTM card, replacing the optical tx/rx part with a copper conventional one.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.8.1.2	FTM ready for milestone #1	$0	0	0
1.1.1.8.1.3	Protoype FTM: spec, design and layout	$11,874	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
8	ElecEngF	25%	120 hrs	0 days	Wed 10/30/02	Thu 1/30/03
9	ElecTechF	50%	240 hrs	0 days	Wed 10/30/02	Thu 1/30/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	ElecEngF	25%	$6,114	$0	$0	$6,114
9	ElecTechF	50%	$5,760	$0	$0	$5,760

Notes

Labor:
1. Electrical Eng. (50%) specifications, design and firmware development
2. Electrical Tech. (50%) layout

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.8.1.4	Prototype FTM Submission	$0	0	0

WBS	Name	Cost	M&S Cont.	Labor Cont.
"Prototype FTM Submission" continued				
1.1.1.8.1.5	Prototype FTM: procurement and assembly	$22,500	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
2	FNALR&D	0%	0 hrs	0 days	Tue 3/4/03	Tue 3/4/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	$22,500	$0	$0	$22,500

Notes

Schedule:
It takes 20 days to manufacture the board + 20 days for installing and assembly FPGA and connectors.
Cost:
based on the price of the IIa FTM card.
$1,000 PCB
$500.00 FPGA
$500.00 Ball Grid Array assembly of FPGA
$2,500 for miscellanea components and assembly.
Total is $4,500 per FTM.
5 boards as prototype. Total is 22,500

1.1.1.8.1.6	Prototype FTM: test and evaluation	$5,470	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
8	ElecEngF	10%	32 hrs	0 days	Wed 4/30/03	Wed 6/25/03
9	ElecTechF	50%	160 hrs	0 days	Wed 4/30/03	Wed 6/25/03
16	PostDocU	50%	160 hrs	0 days	Wed 4/30/03	Wed 6/25/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	ElecEngF	10%	$1,630	$0	$0	$1,630
9	ElecTechF	50%	$3,840	$0	$0	$3,840
16	PostDocU	50%	$0	$0	$0	$0

Notes

Labor:
assembling labor is costed in the manufacturing.
Labor here is just for testing the card with the DAQ system.

1.1.1.8.1.7	Prototype FTM available	$0	0	0
1.1.1.8.2	**FTM preproduction**	**$61,194**	**0**	**0**
1.1.1.8.2.1	Preproduction FTM: spec, design and layout	$17,988	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
8	ElecEngF	50%	240 hrs	0 days	Wed 3/10/04	Wed 6/2/04
9	ElecTechF	50%	240 hrs	0 days	Wed 3/10/04	Wed 6/2/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	ElecEngF	50%	$12,228	$0	$0	$12,228

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Preproduction FTM: spec, design and layout" continued

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	ElecTechF	50%	$5,760	$0	$0	$5,760

Notes

Schedule:
This is intended to be the final FTM design (i.e. preproduction).

1.1.1.8.2.2	Preproduction FTM Submission	$0	0	0
1.1.1.8.2.3	Preproduction FTM: procurement and assembly	$35,000	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	35,000	35,000	0 days	Thu 6/3/04	Thu 7/29/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	35,000	$35,000	$0	$0	$35,000

Notes

Need 10 cards as preproduction.
Cost:
based on the price of the IIa FTM card.
$3,500 per board (includes components, assembling, connectors etc.).
This is less expensive than the prototypes due to the larger quantity.
Engineering estimate. 50% contingency added
Total $35,000

1.1.1.8.2.4	Preproduction FTM: test and evaluation	$8,206	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
8	ElecEngF	10%	48 hrs	0 days	Fri 7/30/04	Fri 10/22/04
9	ElecTechF	50%	240 hrs	0 days	Fri 7/30/04	Fri 10/22/04
16	PostDocU	50%	240 hrs	0 days	Fri 7/30/04	Fri 10/22/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	ElecEngF	10%	$2,446	$0	$0	$2,446
9	ElecTechF	50%	$5,760	$0	$0	$5,760
16	PostDocU	50%	$0	$0	$0	$0

Notes

Labor:
assembling labor is costed in the manufacturing.
Labor here is for testing the card functionality (test) and evaluating the FTM performance in within the DAQ chain (evaluation).
1. Electrical Tech (50%) for testing
2. Research Associate (50%) evaluation
3. Electrical Eng. (10%) support

1.1.1.8.2.5	Preproduction FTM available	$0	0	0

WBS	Name	Cost	M&S Cont.	Labor Cont.
"Preproduction FTM available" continued				
1.1.1.8.3	**FTM Production**	**$141,133**	**0**	**0**
1.1.1.8.3.1	Production FTM: spec, design and layout	$22,064	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
8	ElecEngF	100%	320 hrs	0 days	Mon 10/25/04	Tue 12/21/04
9	ElecTechF	75%	240 hrs	0 days	Mon 10/25/04	Tue 12/21/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	ElecEngF	100%	$16,304	$0	$0	$16,304
9	ElecTechF	75%	$5,760	$0	$0	$5,760

1.1.1.8.3.2	Production go ahead on FTMs	$0	0	0

Notes

Schedule:
Linked to the production go-ahead for cables.

1.1.1.8.3.3	Production: procurement and assembly	$111,000	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	111,000	111,000	0 days	Wed 12/22/04	Mon 2/28/05

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	111,000	$111,000	$0	$0	$111,000

Notes

Cost:
based on FTM cost for IIa.
$3,000 per board (includes components, assembling, etc.).
Need 28 + spares = 37 FTM (+ 10 from the preproduction).
We increase the number of spares because we plan to purchase the most recent parts available (expecially the FPGA) for which backword compatibility with the pre-production parts is not guaranteed.
Total $111,000
Engineering estimate. 50% contingency added.

1.1.1.8.3.4	Production: test	$8,069	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
8	ElecEngF	10%	47.2 hrs	0 days	Fri 1/14/05	Thu 4/7/05
9	ElecTechF	50%	236 hrs	0 days	Fri 1/14/05	Thu 4/7/05
16	PostDocU	50%	236 hrs	0 days	Fri 1/14/05	Thu 4/7/05

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	ElecEngF	10%	$2,405	$0	$0	$2,405
9	ElecTechF	50%	$5,664	$0	$0	$5,664
16	PostDocU	50%	$0	$0	$0	$0

WBS	Name	Cost	M&S Cont.	Labor Cont.
"Production: test" continued				

Notes

Labor:
assembling labor is costed in the manufacturing.
Labor here is just for testing the card with the DAQ system.

1.1.1.8.3.5	Production FTM available	$0	0	0
1.1.1.8.3.6	Production FTMs complete	$0	0	0

Notes

1.1.1.9	**DAQ Testing & Readiness**	**$245,294**	**0**	**0**

Notes

Cost:
Here is the cost of all electrical testing (M&S) at FNAL. Includes DAQ stands, Burn-in stations, computers, miscellanea PC boards and material, cables, tools and instrument (oscilloscope etc. is needed).
added 50% contingency

1.1.1.9.1	**DAQ: upper daq upgrade**	**$140,000**	**0**	**0**
1.1.1.9.1.1	DAQ: SRC, FIB, VRB (FY 2003)	$20,000	0.5	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*
17	*MANDS*	*20,000*	*20,000*	*0 days*	*Mon 6/2/03*	*Fri 6/6/03*

ID	*Resource Name*	*Units*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
17	*MANDS*	*20,000*	*$20,000*	*$0*	*$0*	*$20,000*

Notes

The upper part of the Data Acquisition system should remain unchanged.
The number of channels needed for the the new silicon detector is ~25% less than what is now implemented for the present IIa detector. Number of spares is not a problem.
Nonetheless obsolesence of parts, reliability and flexibility may of the key components (SRC, FIB and VRB) may become a problem.
Cost:
Risk estimate is based on the need to re-do one board (the SRC) and to purchaise spare components for the other boards (FIB and VRB) to cope with obsolescence.
1. new SRC $120,000 Engineering Estimate
2. new components for the FIB, VRB $20,000 Engineering Estimate
Total = $140,000
We spread this over three fiscal years assuming that fy03 is spent primarimaly on the investigation of currently available parts and on the design
and engineering (Labor will be University labor)
FY 2003 $20,000
FY 2004 $60,000
FY 2005 $60,000

And assume a 50% contingency.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.9.1.2	DAQ: SRC, FIB, VRB (FY 2004)	$60,000	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	60,000	60,000	0 days	Wed 6/2/04	Tue 6/8/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	60,000	$60,000	$0	$0	$60,000

1.1.1.9.1.3	DAQ:SRC,FIB,VRB (FY 2005)	$60,000	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	60,000	60,000	0 days	Tue 1/4/05	Mon 1/10/05

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	60,000	$60,000	$0	$0	$60,000

1.1.1.9.2	**DAQ Testing Prototype**	**$42,446**	**0**	**0**
1.1.1.9.2.1	Testing of Prototype DAQ Chain	$42,446	0.6	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
2	FNALR&D	0%	0 hrs	0 days	Tue 10/15/02	Tue 10/15/02
8	ElecEngF	10%	48 hrs	0 days	Wed 10/16/02	Wed 1/15/03
16	PostDocU	100%	480 hrs	0 days	Wed 10/16/02	Wed 1/15/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	$40,000	$0	$0	$40,000
8	ElecEngF	10%	$2,446	$0	$0	$2,446
16	PostDocU	100%	$0	$0	$0	$0

Notes

Test begins when 1st prototype electrical stave is available.
These are specific tests aimed at understanding the functionality of the stave concept.
Cost:
Here is calculated the cost of all electrical testing (M&S) at FNAL up to this phase.
Includes upgrade to DAQ stands and Burn-in stations, new computers, bench power suppplies, miscellanea boards and material, cables, tools and instruments.
Most of the above equipment is already available from the IIa effort. This is moslty to upgrade and modify what is already there.
Labor:
This is the labor specifically assigned to understand the DAQ issues and get all the testing equipment ready for production. It is in parallel with the labor assigned to test chips, hybrids, modules and staves.

1.1.1.9.2.2	Contingency: Go ahead for 2nd round prototypes (20)	$0	0	0
1.1.1.9.2.3	Testing of Prototype DAQ Chain Complete- go ahead for #2	$0	0	0

Notes

This Milestone is the point where we decide which, if chips, hybrids, MPC, or the Bus cable need to have another prototype round before going into preproduction.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.9.2.4	Testing of proto #2 DAQ chain	$0	0	0
1.1.1.9.2.5	Project Pacing: Preproduction go ahead	$0	0	0
1.1.1.9.2.6	Go ahead for Preproduction	$0	0	0

Notes

This is the completion of the tests of any second round prototypes for chips, hybrids, MPC or Bus cables.

1.1.1.9.3	**DAQ Testing Production**	**$62,848**	**0**	**0**
1.1.1.9.3.1	Ready to test PreProduction DAQ chain	$0	0	0

Notes

This is an important milestone.
All preproduction parts are meant to be "final" part with provision for minor changes if needed between preproduction and production.
Preproduction parts that need to be ready are:
1. Stave
2. JPC (prototype)
3. FTM (prototype)
4. MPC-JPC cables
5. JPC-crates cables
6. Power Supply (prototype)

1.1.1.9.3.2	Testing of Preproduction DAQ chain	$62,848	0.6	0.5

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*
8	*ElecEngF*	*25%*	*38 hrs*	*0 days*	*Mon 11/3/03*	*Mon 12/1/03*
9	*ElecTechF*	*25%*	*38 hrs*	*0 days*	*Mon 11/3/03*	*Mon 12/1/03*
16	*PostDocU*	*200%*	*304 hrs*	*0 days*	*Mon 11/3/03*	*Mon 12/1/03*
17	*MANDS*	*60,000*	*60,000*	*0 days*	*Mon 11/3/03*	*Tue 1/13/04*

ID	*Resource Name*	*Units*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
8	*ElecEngF*	*25%*	*$1,936*	*$0*	*$0*	*$1,936*
9	*ElecTechF*	*25%*	*$912*	*$0*	*$0*	*$912*
16	*PostDocU*	*200%*	*$0*	*$0*	*$0*	*$0*
17	*MANDS*	*60,000*	*$60,000*	*$0*	*$0*	*$60,000*

Notes

Test begin when 1st preproduction stave is available.
All various pieces should be ordered for production quantities based on this final test.

Cost:
Here is the cost of further electrical testing equipment at FNAL. Includes DAQ stands, Burn-in stations, computers, miscellanea PC boards and material, cables, tools and instruments. Most of the material is already in hand.
added 50% contingency

1.1.1.9.3.3	Contingency on DAQ production go ahead (20)	$0	0	0

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.9.3.4	DAQ Production Go-Ahead	$0	0	0

Notes

This date marks the end of all decisions regarding ordering production quantities for all DAQ parts.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.10	**Power Supply system**	**$642,404**	**0**	**0**

Notes

We need a new power supply system in order to provide power to the detector.
The power distribution is per stave (1 AVDD, 1 DVDD and 2 High Voltages).
Channel count for the above scheme is provided in the table.

power_supply.doc

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.10.1	**Power Supplies Prototype**	**$27,771**	**0**	**0**
1.1.1.10.1.1	Selection of New Supplies	$0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	*PostDocU*	*25%*	*80 hrs*	*0 days*	*Fri 4/5/02*	*Fri 5/31/02*	*$0*	*$0*	*$0*	*$0*

Notes

Search the market for available solutions.
Labor:
Done at INFN-Padova.
Estimated in 0.25 FTE

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.10.1.2	Procure sample supplies	$20,000	0.3	0

ID	Resource Name	Units	Work	Delay	Start	Finish
4	*Italy - In Kind*	*0%*	*0 hrs*	*0 days*	*Fri 5/31/02*	*Fri 5/31/02*

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
4	*Italy - In Kind*	*0%*	*$20,000*	*$0*	*$20,000*	*$0*

Notes

We need to have these ready to use for milestone#1.
Cost:
Based on CAEN quotation:
1. Crate $10,000
2. module A1551-HV $3,100
3. module A1518-LV $2,900
4 cables, connectors, load box, miscellanea material $1,500
Total $17,500 + $2,500 contingency = $20,000

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.10.1.3	Prototype Power Supplies available	$0	0	0

WBS	Name	Cost	M&S Cont.	Labor Cont.
"Prototype Power Supplies available" continued				
1.1.1.10.1.4	Test general features of Power supplies	$0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish
16	PostDocU	100%	664 hrs	0 days	Wed 9/25/02	Tue 1/28/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	PostDocU	100%	$0	$0	$0	$0

Notes

These tests are aimed at checking that the functionality of the new system is compatible with the runiib deisgn and needs.
Labor:
Done at INFN-Padova. No FNAL labor
Estimated labor 1.0 FTE

1.1.1.10.1.5	Evaluate power supplies	$7,771	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
8	ElecEngF	20%	96 hrs	0 days	Wed 1/29/03	Tue 4/22/03
9	ElecTechF	25%	120 hrs	0 days	Wed 1/29/03	Tue 4/22/03
16	PostDocU	100%	480 hrs	0 days	Wed 1/29/03	Tue 4/22/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	ElecEngF	20%	$4,891	$0	$0	$4,891
9	ElecTechF	25%	$2,880	$0	$0	$2,880
16	PostDocU	100%	$0	$0	$0	$0

Notes

Schedule:
Sample power supplies will be used for milestone#1
Labor:
This is the final System test with the electrical stave and is done at FNAL by-Padova personnel.
1. Elect. Technician (50%) from INFN-Padova
2. Research Associate (50%) from INFN-Padova
3. Electrical Eng. (20%) from FNAL
4. Electrical Tech. (25%) from FNAL

1.1.1.10.1.6	Final Decision on Power Supply System	$0	0	0

Notes

Schedule:
This milestone marks the decision point on the power supply system.
Final decision taken after the preproduction DAQ chain is fully tested.

1.1.1.10.2	**Power Supplies Production**	**$614,633**	**0**	**0**
1.1.1.10.2.1	Patch Panel: design and test	$5,934	1	1

ID	Resource Name	Units	Work	Delay	Start	Finish
8	ElecEngF	10%	32 hrs	0 days	Wed 1/14/04	Wed 3/10/04

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Patch Panel: design and test" continued

ID	Resource Name	Units	Work	Delay	Start	Finish
9	ElecTechF	30%	96 hrs	0 days	Wed 1/14/04	Wed 3/10/04
16	PostDocU	40%	128 hrs	0 days	Wed 1/14/04	Wed 3/10/04
17	MANDS	2,000	2,000	0 days	Wed 1/14/04	Wed 3/10/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	ElecEngF	10%	$1,630	$0	$0	$1,630
9	ElecTechF	30%	$2,304	$0	$0	$2,304
16	PostDocU	40%	$0	$0	$0	$0
17	MANDS	2,000	$2,000	$0	$0	$2,000

Notes

The patch panel is necessary to map the HV and LV power supply channels to the JPCs.
Cost:
based on physicist estimate.
$2,000 per panel including connectors, terminations, patch panel cabling etc.
Protoype is 1 panel.
100% contingency applied.
Labor:
1. Research Associate (40%)
2. elect. technician (30%)
3. elect. engineer (10%)

1.1.1.10.2.2	Power supply Production go ahead	$0	0	0
1.1.1.10.2.3	Power Supply: procurement	$571,254	0.3	0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	571,254	571,254	0 days	Wed 1/14/04	Tue 6/15/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	571,254	$571,254	$0	$0	$571,254

Notes

Cost:
Each JPC worth of staves can be power by a single A1511 module for the High Voltages and 2 A1517A modules for the Low Voltages.
With 18 JPCs per side (we have 2 sides where the cables come out) the total number of modules required are 72 Low Voltage and 36 High Voltage.
To the above we need to add L0 with 32 LV and 8 HV modules total.
Cost is based on a quote from CAEN (OF/32/2002 and OF/33/2002 as of 01/31/02)
LV module cost is 3,100 euro
HV module cost is 3,232 euro
Total cost (including spares) for 120 LV and 50 HV modules is 533,600 euro.
To the above we need to add the cost of 8 +2 spares crates at the cost of 8,677 euro each.
Total cost for the system is **620,370 euro (571,254 USD).**
INFN contributes with 150Keuro = 132 K$ (Buy Backs)
Contingency is 30%

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.1.10.2.4	Production Power Supply Available	$0	0	0
1.1.1.10.2.5	Power Supply: Testing	$21,312	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
9	ElecTechF	50%	888 hrs	0 days	Wed 5/5/04	Thu 3/24/05
16	PostDocU	50%	888 hrs	0 days	Wed 5/5/04	Thu 3/24/05

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	ElecTechF	50%	$21,312	$0	$0	$21,312
16	PostDocU	50%	$0	$0	$0	$0

Notes

Labor:
Production tests will be done at FNAL.
this is estimated from the runiia experience
We assume that 1 tech at 100% could test 1 power supply modules per day.
~110 modules needed.
Some help from INFN-Padova at the beginning for test setup.

1.1.1.10.2.6	Power Supply Complete	$0	0	0
1.1.1.10.2.7	Patch Panel: production	$16,133	1	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
9	ElecTechF	10%	47.2 hrs	0 days	Thu 5/6/04	Thu 7/29/04
17	MANDS	15,000	15,000	0 days	Thu 5/6/04	Fri 7/30/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	ElecTechF	10%	$1,133	$0	$0	$1,133
17	MANDS	15,000	$15,000	$0	$0	$15,000

Notes

Cost:
Based on Physicist estimate of 1.5K$/panel for production.
Need 8 panels + 2 spares = 15K$
Added 100% contingency.
Labor:
This is for testing the panels (parts and assembly included in the cost).
1. Elect. Technician (10%) ~ 1week of work

1.1.2	**Sensors**	**$1,649,138**	**0**	**0**

Notes

The table below summarizes the type and number of sensors needed:

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Sensors" continued

Notes

Silicon Sensors

Layer	Type	Φ-seg.	Z-seg.	Length	Width	Pitch	Total
5	A	30	6	96.4	40.5	75/37.5	360
5	A	30	6	96.4	40.5	75/37.5	360
4	A	24	6	96.4	40.5	75/37.5	288
4	2.5°	24	6	96.4	43.1	80/40	288
3	A	18	6	96.4	40.5	75/37.5	216
3	2.5°	18	6	96.4	43.1	80/40	216
2	A	12	6	96.4	40.5	75/37.5	144
2	2.5°	12	6	96.4	43.1	80/40	144
1	A	6	6	96.4	40.5	75/37.5	72
1	A	6	6	96.4	40.5	75/37.5	72
0	A	12	6	96.4	14.8	50/25	144

	Sensors Quantity	Total (+ 20% spares)
Outer Axials	1512	1814
Outer Stereo	648	778
L0	144	172
TOTAL	2304	2764

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.2.1	Outer layers	$1,558,029	0	0

Notes

We are going to prototype the outer stereo and Axial sensors.
Runs:
1. Prototypes Axials and Small Angle Stereo (30 grade "A"+30 grade "B" each)
2. Production (Axials, SAS and L0)
3. Puchase leftover L00 sensors (same design as used in Run IIa is used for Run IIb)

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.2.1.1	**Outer Sensors Prototypes (FNAL)**	**$138,049**	**0**	**0**

Notes

The outer axial prototypes are provided by Tsukba with in-kind contribution.
The prototype staves will be built using primarily the axials.
The SAS sesnor order is placed through FNAL and follows the axial order
due to extra design and layout time.

1.1.2.1.1.1	Dummy Sensors: layout	$0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	PostDocU	25%	20 hrs	0 days	Mon 4/1/02	Fri 4/12/02	$0	$0	$0	$0

Notes

Labor:
This is to prepare masks for dummy sensors (1 metal mask)
Schedule:
work can start once the real prototype sensor layout is finished.

1.1.2.1.1.2	Dummy Sensors: manufacturing	$13,200	0.3	0

ID	Resource Name	Units	Work	Delay	Start	Finish
2	FNALR&D	0%	0 hrs	0 days	Tue 7/9/02	Tue 7/9/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	$13,200	$0	$13,200	$0

Notes

These are metallised dummy sensors for bonding and mechanical tests.
We are also going to have real mechanicals (just silicon) which is diced at Fermilab.
Cost:
based on quotation XXX from Polishing Corporation of America and quotation YYY from
Process Speicalties:
1. 6" Silicon 100 wafers @ 30.00 each = $3,000
2. 1 mask (metal) @ 1,700
3. metallization $65.00/wafer = $6,500
4. dicing is about $20.00/wafer = $2,000
Total $13,200
100 wafers yields 100 detectors axials and 100 detectors stereo.
Contingency is 30%

1.1.2.1.1.3	Prototype Sensor Layout	$20,336	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish
7	PhysicistF	10%	64 hrs	0 days	Mon 2/4/02	Fri 5/24/02
10	DesignerSF	50%	320 hrs	0 days	Mon 2/4/02	Fri 5/24/02
11	MechEngSF	30%	192 hrs	0 days	Mon 2/4/02	Fri 5/24/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PhysicistF	10%	$0	$0	$0	$0

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Prototype Sensor Layout" continued

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	50%	$12,205	$0	$12,205	$0
11	MechEngSF	30%	$8,131	$0	$8,131	$0

Notes

Sensors designed to minimize cost by adopting many aspects of the CMS sesor specifications.

1.1.2.1.1.4 Prototype Sensors: submission (SAS) $0 0 0

Notes

We estimate 40 days to complete the small angle stereo layout.
This follows the axial layout.

1.1.2.1.1.5 Prototype Sensor manufacturing (SAS) $96,673 0.3 0

ID	Resource Name	Units	Work	Delay	Start	Finish
2	FNALR&D	0%	0 hrs	0 days	Tue 5/28/02	Tue 5/28/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	$96,673	$0	$96,673	$0

Notes

Cost:
Based on quotation n. 030282002 from Hamamatsu (March 28 2002)
SAS:30 grade A @99,800 Yen + 30 grade B@59,900 Yen +7,211,000 Yen (NRE,masks,silicon)
total SAS = **12,002,000 Yen (96,673 USD)**
Above originated from FNAL.
Based on quotation n. 03062002 from Hamamatsu (March 6 2002)
Axial:30 grade A @$792.00 + 30 grade B@$475.00 +$43,000 (NRE,masks,silicon)
total Axial = **81,010 USD**
Above originated from Japan.
30% Contingency added
Schedule: The FNAL order is for the SAS sensors. These followed the submission of the axial sensors by 2 month (40days).
The duration is longer than for the axial sensors due to vacations in August.

1.1.2.1.1.6 Prototype Sensors Available (axials in US)) $0 0 0

Notes

Prototype sensors are available for testing in US.
This allows 10 days for testing in Japan and shipping.

1.1.2.1.1.7 Prototype Sensors Available (SAS in US)) $0 0 0

Notes

Prototype sensors are available for testing in US.

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Prototype Sensors Available (SAS in US))" continued

Notes

This allows 10 days for testing in Japan and shipping.

1.1.2.1.1.8	Prototype Sensor evaluation and Radiation tests	$7,840	0.5	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
2	FNALR&D	0%	0 hrs	0 days	Tue 7/30/02	Tue 7/30/02
7	PhysicistF	25%	160 hrs	0 days	Wed 7/31/02	Wed 11/20/02
9	ElecTechF	25%	160 hrs	0 days	Wed 7/31/02	Wed 11/20/02
16	PostDocU	50%	320 hrs	0 days	Wed 7/31/02	Wed 11/20/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	$4,000	$0	$0	$4,000
7	PhysicistF	25%	$0	$0	$0	$0
9	ElecTechF	25%	$3,840	$0	$0	$3,840
16	PostDocU	50%	$0	$0	$0	$0

Notes

Cost:
This is the FNAL cost related to setup some radiation damage test (special boards), and tests at the probe station.
All needed equipment already in hand for a small task such as this (we estimate of the order of 20 detectors to be re-checked at this stage at FNAL)
Estimated from IIa
$100 each rad-test board (10 boards)
$500 box of needles for the probe station
$1,500 PC with labview controlling the probestation equipment.
$1,000 miscellanea cables and connectors.
Total $4,000
Labor:
This is done mostly in Japan (Tsukuba and Okayama).
FNAL will just verify some of the measurements and perform radiation damage tests.
Schedule: The tests at FNAL lag behind the testing at Tsukuba by 1month to allow for testing and delivery to FNAL.

1.1.2.1.2	**Outer Sensors Production (FNAL)**	**$612,429**	**0**	**0**
1.1.2.1.2.1	Sensor final design work (axials)	$6,117	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
10	DesignerSF	50%	76 hrs	0 days	Thu 9/26/02	Tue 10/22/02
11	MechEngSF	50%	76 hrs	0 days	Thu 9/26/02	Tue 10/22/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	50%	$2,899	$0	$0	$2,899
11	MechEngSF	50%	$3,219	$0	$0	$3,219

Notes

We are assuming that nothing should change in the design of the sensors. This re-work is scheduled only for very minor modifications if needed.
It begins 40 days after axial sensor testing begins in US.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.2.1.2.2	Sensor final design work (SAS)	$6,117	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
10	DesignerSF	50%	76 hrs	0 days	Thu 11/14/02	Thu 12/12/02
11	MechEngSF	50%	76 hrs	0 days	Thu 11/14/02	Thu 12/12/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	50%	$2,899	$0	$0	$2,899
11	MechEngSF	50%	$3,219	$0	$0	$3,219

Notes

We are assuming that nothing should change in the design of the sensors. This re-work is scheduled only for very minor modifications if needed.
It begins 40 days after axial sensor testing begins in US.

1.1.2.1.2.3	Project Pacing: production sensor order	$0	0	0

Notes

We are assuming that nothing should change in the design of the sensors. This re-work is scheduled only for very minor modifications if needed.
THis is contingency since we are planning not to change the sensors masks.

1.1.2.1.2.4	Production Sensor submission (axials)	$0	0	0

Notes

Schedule:
We can order production silicon after the final layout is finished.
This milestone initiates the 1st half of the Japanese production sensor order.
It is followed by the 1st half of the US production sensor order.
The second half the the Japanese and US orders lag in order to spread

1.1.2.1.2.5	Production Sensor submission (SAS)	$0	0	0

Notes

Schedule:
As with the prototype sensors, the SAS sensor order will follow the axial order.

1.1.2.1.2.6	Production Sensors manufacturing	$300,097	0.3	0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	300,097	300,097	0 days	Thu 5/22/03	Mon 9/29/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	300,097	$300,097	$0	$0	$300,097

Notes

Schedule:
Hamamatsu will deliver 200 detectors/month after a lag time of 4 months from
receipt of order. 2,592 detectors/200/month = 13 + 4 month = 340 days
We need to add 1 month for the L0 production (see "L0 sensor production")

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Production Sensors manufacturing" continued

Notes

Total months 18 = 360 days
Cost:
Based on quotation n. 030282002 from Hamamatsu (March 28 2002).
Axials:
1512 needed +20% spares = 1800 * 58,000Yen + 7,200,000Yen (masks + NRE +Silicon).
Total = **111,600,000 Yen** (**899,788 USD)**.
Stereo:
648 needed +20% spares = 770 * 61,000Yen + 6,400,000Yen (masks + NRE +Silicon).
Total = **53,370,000 Yen** (**430,300 USD)**.
Total Outer Sensors cost is **164,970,000 Yen (1,330,088 USD)**
Part of the bid is originated from FNAL and part of it directly from Japan.
The Japan originated part is a contribution in kind.
FNAL originated part is **74.63 MYen (600,193 USD)**
Japan originated part is **90.34 MYen (726,541 USD)**
Japan contribution is 100% of the total cost. 600,193 USD as Buy Backs
Contingency is 30%
Each order FNAL and Japan has been split into 2 separate 1/2 orders to spread the costs
over the fiscal year boundaries. They have been timed to correspond to the
Japanese and US fiscal years and when the money is available.
We assume Production sensors are available starting 4months (80days) after the 1st order is received.
The orders are placed with HPK such that production doesn't stop and delivery is continous
The layer 0 production order will be submitted at the same time as the outer layers
but the actual sensor production will be delayed until after half the outer layer sensors
have been produced.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.2.1.2.7	Production Sensors manufacturing	$300,097	0.3	0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	300,097	300,097	0 days	Thu 5/13/04	Mon 9/20/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	300,097	$300,097	$0	$0	$300,097

Notes

Schedule:
Hamamatsu will deliver 200 detectors/month after a lag time of 4 months from
receipt of order. 2,592 detectors/200/month = 13 + 4 month = 340 days
We need to add 1 month for the L0 production (see "L0 sensor production")
Total months 18 = 360 days
Cost:
Based on quotation n. 030282002 from Hamamatsu (March 28 2002).
Axials:
1512 needed +20% spares = 1800 * 58,000Yen + 7,200,000Yen (masks + NRE +Silicon).
Total = **111,600,000 Yen** (**899,788 USD)**.
Stereo:
648 needed +20% spares = 770 * 61,000Yen + 6,400,000Yen (masks + NRE +Silicon).
Total = **53,370,000 Yen** (**430,300 USD)**.

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Production Sensors manufacturing" continued

Notes

Total Outer Sensors cost is **164,970,000 Yen (1,330,088 USD)**
Part of the bid is originated from FNAL and part of it directly from Japan.
The Japan originated part is a contribution in kind.
FNAL originated part is **74.63 MYen (600,193 USD)**
Japan originated part is **90.34 MYen (726,541 USD)**
Japan contribution is 100% of the total cost. 600,193 USD as Buy Backs
Contingency is 30%
Each order FNAL and Japan has been split into 2 separate 1/2 orders to spread the costs
over the fiscal year boundaries. They have been timed to correspond to the
Japanese and US fiscal years and when the money is available.
We assume Production sensors are available starting 4months (80days) after the 1st order is received.
The orders are placed with HPK such that production doesn't stop and delivery is continous
he layer 0 production order will be submitted at the same time as the outer layers
but the actual sensor production will be delayed until after half the outer layer sensors
have been produced.

1.1.2.1.2.8	Project Pacing: production sensors manufacturing	$0	0	0

Notes

Schedule:
4 months contingency added on the delivery of the sensors.

1.1.2.1.2.9	Production Sensors Available (in US)	$0	0	0

Notes

We assume Production sensors are available in Japan for testing starting 4months (80days) after the 1st order is received.
Production sensors are available in the US 1 month after testing begins in Japan.
The orders are placed with HPK such that production doesn't stop and delivery is continous

1.1.2.1.2.10	Production Sensors Complete	$0	0	0

Notes

We assume Production sensors are available starting 4months (80days) after the 1st order is received.
The orders are placed with HPK such that production doesn't stop and delivery is continous

1.1.2.1.3	**Outer Sensors (Japan)**	**$807,551**	**0**	**0**
1.1.2.1.3.1	Prototype Sensors: submission (axials)	$0	0	0

Notes

We estimate 40 days to complete the axial sensor layout.

1.1.2.1.3.2	Prototype Sensor manufacturing	$81,010	0.3	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*
6	*Japan - In Kind*	*0%*	*0 hrs*	*0 days*	*Mon 4/1/02*	*Mon 4/1/02*

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Prototype Sensor manufacturing" continued

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	Japan - In Kind	0%	$81,010	$0	$81,010	$0

Notes

Cost:
Based on quotation n. 030282002 from Hamamatsu (March 28 2002)
SAS:30 grade A @99,800 Yen + 30 grade B@59,900 Yen +7,211,000 Yen (NRE,masks,silicon)
total SAS = **12,002,000 Yen (96,673 USD)**
Above originated from FNAL.
Based on quotation n. 03062002 from Hamamatsu (March 6 2002)
Axial:30 grade A @$792.00 + 30 grade B@$475.00 +$43,000 (NRE,masks,silicon)
total Axial = **81,010 USD**
Above originated from Japan.
30% Contingency added

1.1.2.1.3.3 Prototype Sensors Available (axials in Japan) $0 0 0

Notes

Prototype sensors are available for testing in Japan.
They are delivered to FNAL 20 days later after testing and shipping.

1.1.2.1.3.4 Prototype Sensors Available (SAS in Japan) $0 0 0

Notes

These are the Prototype small angle sensors.
They are available for testing in Japan.
They are delivered to FNAL 20 days later after testing and shipping.

1.1.2.1.3.5 Prototype Sensors tests $0 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish
16	PostDocU	100%	640 hrs	0 days	Wed 7/17/02	Wed 11/6/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	PostDocU	100%	$0	$0	$0	$0

Notes

Quality assurance and tests made at the manufacturing company.
U.Tsukuba and U.Okayama will thoroughly verify manufacturer's measurements
with the prototypes.
We have 30 axial (grade"A") and 30 stereo (grade "A") to be fully tested.
And we have 30 axial (grade"B") and 30 stereo (grade "B") to be tested.
We assume we can test at least 10 sensors/week.

At this rate we estimated 1 FTE.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.2.1.3.6	Production Sensors manufacturing	$363,271	0.3	0

ID	Resource Name	Units	Work	Delay	Start	Finish
6	Japan - In Kind	0%	0 hrs	0 days	Wed 11/20/02	Wed 11/20/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	Japan - In Kind	0%	$363,271	$0	$0	$363,271

Notes

Schedule:
Hamamatsu will deliver 200 detectors/month after a lag time of 4 months from
receipt of order. 2,592 detectors/200/month = 13 + 4 month = 340 days
We need to add 1 month for the L0 production (see "L0 sensor production")
Total months 18 = 360 days
Cost:
Based on quotation n. 030282002 from Hamamatsu (March 28 2002).
Axials:
1512 needed +20% spares = 1800 * 58,000Yen + 7,200,000Yen (masks + NRE +Silicon).
Total = **111,600,000 Yen** (**899,788 USD)**.
Stereo:
648 needed +20% spares = 770 * 61,000Yen + 6,400,000Yen (masks + NRE +Silicon).
Total = **53,370,000 Yen** (**430,300 USD)**.
Total Outer Sensors cost is **164,970,000 Yen (1,330,088 USD)**
Part of the bid is originated from FNAL and part of it directly from Japan.
The Japan originated part is a contribution in kind.
FNAL originated part is **74.63 MYen (600,193 USD)**
Japan originated part is **90.34 MYen (726,541 USD)**
Japan contribution is 100% of the total cost. 600,193 USD as Buy Backs
Contingency is 30%
Each order FNAL and Japan has been split into 2 separate 1/2 orders, each 90 days long to spread the costs over the fiscal year boundaries. They have been timed to correspond to the
Japanese and US fiscal years and when the money is available.
We assume Production sensors are available starting 4months (80days) after the 1st order is received.
The orders are placed with HPK such that production doesn't stop and delivery is continous
The layer 0 production order will be submitted at the same time as the outer layers
but the actual sensor production will be delayed until after half the outer layer sensors
have been produced.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.2.1.3.7	Production sensor manufacturing	$363,271	0.3	0

ID	Resource Name	Units	Work	Delay	Start	Finish
6	Japan - In Kind	0%	0 hrs	0 days	Fri 8/15/03	Fri 8/15/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	Japan - In Kind	0%	$363,271	$0	$0	$363,271

Notes

Schedule:
Hamamatsu will deliver 200 detectors/month after a lag time of 4 months from

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Production sensor manufacturing" continued

Notes

receipt of order. 2,592 detectors/200/month = 13 + 4 month = 340 days
We need to add 1 month for the L0 production (see "L0 sensor production")
Total months 18 = 360 days
Cost:
Based on quotation n. 030282002 from Hamamatsu (March 28 2002).
Axials:
1512 needed +20% spares = 1800 * 58,000Yen + 7,200,000Yen (masks + NRE +Silicon).
Total = **111,600,000 Yen** (**899,788 USD)**.
Stereo:
648 needed +20% spares = 770 * 61,000Yen + 6,400,000Yen (masks + NRE +Silicon).
Total = **53,370,000 Yen** (**430,300 USD)**.
Total Outer Sensors cost is **164,970,000 Yen (1,330,088 USD)**
Part of the bid is originated from FNAL and part of it directly from Japan.
The Japan originated part is a contribution in kind.
FNAL originated part is **74.63 MYen (600,193 USD)**
Japan originated part is **90.34 MYen (726,541 USD)**
Japan contribution is 100% of the total cost. 600,193 USD as Buy Backs
Contingency is 30%
Each order FNAL and Japan has been split into 2 separate 1/2 orders to spread the costs
over the fiscal year boundaries. They have been timed to correspond to the
Japanese and US fiscal years and when the money is available.
We assume Production sensors are available starting 4months (80days) after the 1st order is received.
The orders are placed with HPK such that production doesn't stop and delivery is continous
he layer 0 production order will be submitted at the same time as the outer layers
but the actual sensor production will be delayed until after half the outer layer sensors
have been produced.

1.1.2.1.3.8	Production Sensors Available (Japan)	$0	0	0

Notes

We assume Production sensors are available in Japan for testing starting 4months (80days) after the 1st order is received.
The orders are placed with HPK such that production doesn't stop and delivery is continous

1.1.2.1.3.9	Sensor Testing	$0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish
16	PostDocU	150%	4,320 hrs	0 days	Thu 3/27/03	Fri 8/27/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	PostDocU	150%	$0	$0	$0	$0

Notes

Testing includes Outer Axials, Outer SAS and L0
Schedule:
Testing will be done by the vendor (included in the sensors price).
We will receive 200 sensors/month.

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Sensor Testing" continued

Notes

Japan will probe a sample (<~10%) of the sensor production once the prototype gave us confidence on the quality and reliability of the vendor measurements. This is done in parallel with the sensors production. 10% of 200 is 20 sensors to test each month.
Cost:
All equipment costs handled by Japan (Tsukuba and Okayama).
Labor:
Provided by Japan
Estimated to be 1.5 FTE

1.1.2.2	**layer L0**	**$85,059**	**0**	**0**

Notes

Given the small number of detectors needed and the use of the same technology as for the Outer sensors we order directly the production.
Need **144** for the project.

1.1.2.2.1	L0 Sensor final design work	$0	0	0

Notes

This work is linked with the mechanical understanding of the L0 structure.
We are planning to use the same identical sensors used for L00 in which case no re-designing will be necessary. This task is contingency since no mask re-designing is planned.
Labor:
most of the work is in the general mechanical layout of the sensors. Also lots of detailing is needed

1.1.2.2.2	L0 Production sensor order	$0	0	0

1.1.2.2.3	L0 sensors production	$85,059	0.3	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*
17	*MANDS*	*85,059*	*85,059*	*0 days*	*Tue 9/16/03*	*Mon 10/13/03*

ID	*Resource Name*	*Units*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
17	*MANDS*	*85,059*	*$85,059*	*$0*	*$0*	*$85,059*

Notes

Schedule:
172 detectors needed. This is ~1 month worth of production.
We assume here this "dedicated" month to be in mid 2003.
Cost:
Based on quotation n. 030282002 from Hamamatsu (March 28 2002)
144 sensors needed + 20% spares = 170*28,000 Yen + 5,800,000 Yen (Masks, NRE, Silicon)
Total **10,560,000 Yen (85,059 USD)**.
Japan contributes 100% as Buy Back
Contingency is 30%
he layer 0 production order will be submitted at the same time as the outer layers
but the actual sensor production will be delayed until after half the outer layer sensors
have been produced.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.2.2.4	Sensor Testing	$0	0	0

Notes
Labor:
Already considered in the outer sensors testing.

1.1.2.2.5	L0 Sensors Available	$0	0	0
1.1.2.2.6	L0 Sensors Complete	$0	0	0
1.1.2.3	**layer L00 left over**	**$6,050**	**0**	**0**

Notes
These are left over sensors from the L00 production at Hamamatsu. They are identical to those we will use for the current L0 and we want to purchaise them to have a jump start at testing.

1.1.2.3.1	L00 sensors purchase	$6,050	0.3	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
6	*Japan - In Kind*	*0%*	*0 hrs*	*0 days*	*Tue 7/9/02*	*Tue 7/9/02*	*$6,050*	*$0*	*$6,050*	*$0*

Notes
L0 and L00 sensors are identical.
There are 25 L00 sensors left over at Hamamatsu for us to purchaise.
Cost:
30 KYen/sensor (242.00 USD).
Total cost is **6,050 USD**.
In kind contribution from Japan.
30% contingency added.

1.1.3	**Construction of Modules, Staves and L0**	**$1,770,403**	**0**	**0**

Notes
Need 180 staves, 1080 modules for the outer
72 modules for L0

1.1.3.1	Beginning of Mechanical Project	$0	0	0

Notes
This task marks the end of the conceptual work and the beginning of the specific realization of mechanical parts.

1.1.3.2	**L0 Construction**	**$344,609**	**0**	**0**

Notes
Required quantity for the L0 detector is 72 modules. We should schedule and cost 100 production modules based on the L00 experience

1.1.3.2.1	**L0 analogue signal cables**	**$47,062**	**0**	**0**

Notes
These are Kapton cables which carry the analog signals from the silicon to the input of the SVX4 chips.
We assume we will have 2 long (580mm), 2 medium (400mm) and 2 short (220mm) cables per sector (12*2 sectors in total).
Runs:
1. many small test run just to adjust the process
2. preproduction

WBS	Name	Cost	M&S Cont.	Labor Cont.

"L0 analogue signal cables" continued

Notes

3. production

Total cables needed = **144**

1.1.3.2.1.1	**L0 cable prototype (FNAL)**	**$24,693**	**0**	**0**
1.1.3.2.1.1.1	L0 cables technology testing	$6,925	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish
12	ElecTechSF	10%	159.2 hrs	0 days	Mon 9/3/01	Fri 6/21/02
14	WirebonderSF	5%	79.6 hrs	0 days	Mon 9/3/01	Fri 6/21/02
16	PostDocU	10%	159.2 hrs	0 days	Mon 9/3/01	Fri 6/21/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	ElecTechSF	10%	$4,617	$0	$4,617	$0
14	WirebonderSF	5%	$2,308	$0	$2,308	$0
16	PostDocU	10%	$0	$0	$0	$0

Notes

These are multiple runs with very few cables (L00 style) each just to test the quality of the process.
This effor will determine the technology and vendor we will use for final fabrication.
Labor:
work done in Japan.
Estimated in 0.25 FTE (mostly keep contacts with the vendor and FNAL and some testing)
no FNAL labor except for minimum testing (wirebonding tests, electrical tests).
Cost:
we estimated three runs af few cables each (~$6,000 per run). This is an in-kind contribution from Japan.
50% contingency added

1.1.3.2.1.1.2	L0 Test cables Available	$0	0	0

Notes

These are the L00 design cables. They can be used for electrical test.

1.1.3.2.1.1.3	L0 cable prototype design	$11,947	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish
7	PhysicistF	25%	60 hrs	0 days	Tue 6/11/02	Tue 7/23/02
10	DesignerSF	75%	180 hrs	0 days	Tue 6/11/02	Tue 7/23/02
11	MechEngSF	50%	120 hrs	0 days	Tue 6/11/02	Tue 7/23/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PhysicistF	25%	$0	$0	$0	$0
10	DesignerSF	75%	$6,865	$0	$6,865	$0
11	MechEngSF	50%	$5,082	$0	$5,082	$0

WBS	Name	Cost	M&S Cont.	Labor Cont.

"L0 cable prototype design" continued

Notes

This design goes in parallel with the CF support structure design.
The preproduction design should be also the final design for L0 cables.
Labor:
the design will be done at FNAL.

1.1.3.2.1.1.4	L0 cable prototype available (in US)	$0	0	0

Notes

Assume cables are available in US 10 days after they arrive from the vendor in Japan.

1.1.3.2.1.1.5	L0 cable prototype evaluation (US)	$5,820	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
7	PhysicistF	50%	116 hrs	0 days	Thu 1/9/03	Wed 2/19/03
11	MechEngSF	25%	58 hrs	0 days	Thu 1/9/03	Wed 2/19/03
13	MechTechSF	50%	116 hrs	0 days	Thu 1/9/03	Wed 2/19/03
16	PostDocU	50%	116 hrs	0 days	Thu 1/9/03	Wed 2/19/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PhysicistF	50%	$0	$0	$0	$0
11	MechEngSF	25%	$2,456	$0	$0	$2,456
13	MechTechSF	50%	$3,364	$0	$0	$3,364
16	PostDocU	50%	$0	$0	$0	$0

Notes

Labor:
FNAL labor is for testing cables (electrical, mechanical and wirebonding) and establish procedures for cutting and handling them.
Some electrical testing will be done in Japan.
Japan labor estimated to be 1 FTE

1.1.3.2.1.2	**L0 cable production (FNAL)**	**$22,369**	**0**	**0**
1.1.3.2.1.2.1	Project Pacing: L0 cable production	$0	0	0
1.1.3.2.1.2.2	L0 production cable design	$22,369	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
10	DesignerSF	100%	320 hrs	0 days	Fri 6/13/03	Fri 8/8/03
11	MechEngSF	75%	240 hrs	0 days	Fri 6/13/03	Fri 8/8/03
16	PostDocU	25%	80 hrs	0 days	Fri 6/13/03	Fri 8/8/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	100%	$12,205	$0	$0	$12,205
11	MechEngSF	75%	$10,164	$0	$0	$10,164
16	PostDocU	25%	$0	$0	$0	$0

WBS	Name	Cost	M&S Cont.	Labor Cont.

"L0 production cable design" continued

Notes

Labor:
we assume some minor modifications needed to the mecahnics of the cable design.
This is all FNAL labor

1.1.3.2.1.2.3	L0 Cable Production Test	$0	0	0

Notes

Labor:
Non FNAL labor. Tests will be performed in Japan.
It is at this point still unclear whether some repair work on the cables will be needed and whether it can be done in Japan. As contingency the estimated repair work is added to FNAL.

1.1.3.2.1.2.4	L0 cables Available (US)	$0	0	0
1.1.3.2.1.2.5	L0 cables Complete	$0	0	0
1.1.3.2.2	**L0 Cable (Japan)**	**$163,600**	**0**	**0**
1.1.3.2.2.3	**L0 cable Prototype (Japan)**	**$49,600**	**0**	**0**
1.1.3.2.2.3.1	L0 cables technology testing	$20,000	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish
6	Japan - In Kind	0%	0 hrs	0 days	Mon 9/3/01	Mon 9/3/01
16	PostDocU	100%	1,592 hrs	0 days	Mon 9/3/01	Fri 6/21/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	Japan - In Kind	0%	$20,000	$0	$20,000	$0
16	PostDocU	100%	$0	$0	$0	$0

Notes

These are multiple runs with very few cables (L00 style) each just to test the quality of the process.
This effor will determine the technology and vendor we will use for final fabrication.
Labor:
work done in Japan.
Estimate to 1FTE
Cost:
we estimated three runs af few cables each (~$6,000 per run).
This is an in-kind contribution from Japan.
50% contingency added

1.1.3.2.2.3.2	L0 prototype cable fabrication	$29,600	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish
6	Japan - In Kind	0%	0 hrs	0 days	Tue 7/23/02	Tue 7/23/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	Japan - In Kind	0%	$29,600	$0	$29,600	$0

WBS	Name	Cost	M&S Cont.	Labor Cont.

"L0 prototype cable fabrication" continued

Notes

This task is very long to allow multiple prototype runs.
The end of the task is defined by having functional cables for L0 Module construction.
Cost:
Based on quote from KeyCom, Japan
Preproduction quantity is 10 cables for each length.
Type A: 1.080 MYen = 8.1K$
Type B: 1.314 MYen = 9.9K$
Type C: 1.536 MYen = 11.6K$
Total = 29.6K$
Added 50% contingency

1.1.3.2.2.3.3	L0 cable prototype available (Japan)	$0	0	0
1.1.3.2.2.3.4	L0 cable prototype evaluation (japan)	$0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish
16	PostDocU	75%	180 hrs	0 days	Mon 12/16/02	Fri 1/31/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	PostDocU	75%	$0	$0	$0	$0

Notes

Labor:
All electrical testing and quality assurance
is done in Japan. Part of it is done at the company.
Japan labor estimated to be 1.5 FTE

1.1.3.2.2.4	**L0 Production Cable Fabrication**	**$114,000**	**0**	**0**
1.1.3.2.2.4.1	L0 production cable fabrication	$114,000	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	Japan - In Kind	0%	0 hrs	0 days	Fri 8/8/03	Fri 8/8/03	$114,000	$0	$0	$114,000

Notes

6 types of cables, 3 lengths, 48 of each length for the whole detector
Cost:
Based on quote from KeyCom, Japan.
type A: 456k NRE + 62.4k yen/cable = 4.2Myen=$31,668 [220mm long, 48 needed, 60 ordered]
type B: 588k NRE + 72.6kyen/cable = 4.9Myen =$36,946 [400mm long, 48 needed, 60 ordered]
typeC: 636k NRE + 90.0kyen/cable = 6.04Myen=$45,542 [580mm long, 48 needed, 60 ordered]
exchange rate considered is 0.00754 USD/Yen
Total is = 114,156 $

1.1.3.2.2.4.2	L0 production cables available (Japan)	$0	0	0

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.3.2.2.4.3	L0 Cable Production Test	$0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish
16	PostDocU	150%	1,200 hrs	0 days	Tue 9/23/03	Wed 2/18/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	PostDocU	150%	$0	$0	$0	$0

Notes

Labor:
Non FNAL labor. Tests will be performed in Japan.
Some tests are part of the production of the cables and have been priced together with the cable.
Estimated labor in Japan 1.5 FTE.
100% contingency added.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.3.2.4	**layer 0 modules**	**$133,947**	**0**	**0**

Notes

Modules are formed by 2 sensors glued "head-on", a pair of Kapton cables (analogue cable) and one 2-chips L0 hybrid.
Need **72** for the project.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.3.2.4.1	**Layer 0 Module Prototypes**	**$58,721**	**0**	**0**
1.1.3.2.4.1.1	L0 modules R&D and Prototype	$9,995	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	50%	236 hrs	0 days	Wed 1/15/03	Tue 4/8/03
16	PostDocU	100%	472 hrs	0 days	Wed 1/15/03	Tue 4/8/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	50%	$9,995	$0	$0	$9,995
16	PostDocU	100%	$0	$0	$0	$0

Notes

General:
This work is to establish whether the L0 electrical concept is sound.
We could start earlier by using outer layer hybrids for testing purposes.
At the beginning we will use test cables and sensors (old L00 sensors).

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.3.2.4.1.2	L0 module: fixtures design	$16,777	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
10	DesignerSF	100%	240 hrs	0 days	Wed 4/9/03	Tue 5/20/03
11	MechEngSF	75%	180 hrs	0 days	Wed 4/9/03	Tue 5/20/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	100%	$9,154	$0	$0	$9,154
11	MechEngSF	75%	$7,623	$0	$0	$7,623

Notes

Labor:

WBS	Name	Cost	M&S Cont.	Labor Cont.

"L0 module: fixtures design" continued

Notes

Needed to modify the old L00 fixtures

1.1.3.2.4.1.3 L0 module: material and fixtures $20,000 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish
2	FNALR&D	0%	0 hrs	0 days	Tue 5/20/03	Tue 5/20/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	$20,000	$0	$0	$20,000

Notes

Schedule:
we need to have fixtures ready when sensors, hybrids and signal cables for L0 are ready
Cost:
based on Engineering Estimate
1. 2 fixtures for sensor to sensor and cable gluing at 7.5K/fixture =15k
2. 5k for misc. stuff. (material and other small fixtures)

1.1.3.2.4.1.4 L0 prototype module construction $9,118 0 0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	25%	40 hrs	0 days	Fri 7/18/03	Thu 8/14/03
13	MechTechSF	150%	240 hrs	0 days	Fri 7/18/03	Thu 8/14/03
15	CMMProgrammerSF	10%	16 hrs	0 days	Fri 7/18/03	Thu 8/14/03
16	PostDocU	50%	80 hrs	0 days	Fri 7/18/03	Thu 8/14/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	25%	$1,694	$0	$0	$1,694
13	MechTechSF	150%	$6,960	$0	$0	$6,960
15	CMMProgrammerSF	10%	$464	$0	$0	$464
16	PostDocU	50%	$0	$0	$0	$0

Notes

Schedule:

This is done with Preproduction L0 hybrids, Preproduction cables and Production detectors.
Represents the FIRST milestone for the L0 project.
We will make 6 modules to test the final concept.
Labor:
1. mech. tech. (150%) gluing sensors and cables
2. CMM prog. (10%) for setting up program at the CMM to identify sensor fiducials
3. mech engineer (25%) support
4. Research Associate (50%) support

1.1.3.2.4.1.5 L0 Prototype modules available $0 0 0

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.3.2.4.1.6	L0 prototype modules evaluation	$2,832	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
7	PhysicistF	25%	118 hrs	0 days	Fri 8/15/03	Thu 11/6/03
9	ElecTechF	25%	118 hrs	0 days	Fri 8/15/03	Thu 11/6/03
16	PostDocU	100%	472 hrs	0 days	Fri 8/15/03	Thu 11/6/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PhysicistF	25%	$0	$0	$0	$0
9	ElecTechF	25%	$2,832	$0	$0	$2,832
16	PostDocU	100%	$0	$0	$0	$0

Notes

This is the important test for L0, establishing that everything is working properly and that we can proceed to the production phase.
Labor:
1. Research associate (100%) electrical test
2. Elect. Technician (25%) support
3. Scientist (25%) support

1.1.3.2.4.1.7	Project Pacing: L0 module evaluation	$0	0	0

Notes

Contingency on L0 preproduction module evaluation

1.1.3.2.4.1.8	L0 prototype modules complete	$0	0	0
1.1.3.2.4.2	**Layer 0 Module Production**	**$75,226**	**0**	**0**
1.1.3.2.4.2.1	Production L0 module: fixture design	$17,029	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
10	DesignerSF	75%	180 hrs	0 days	Mon 11/10/03	Tue 12/23/03
11	MechEngSF	100%	240 hrs	0 days	Mon 11/10/03	Tue 12/23/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	75%	$6,865	$0	$0	$6,865
11	MechEngSF	100%	$10,164	$0	$0	$10,164

Notes

This is to possibly modify the preproduction fixtures.
This is a contingency task.

1.1.3.2.4.2.2	Production L0 module: material and fixtures	$48,000	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	48,000	48,000	0 days	Wed 1/7/04	Mon 3/1/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	48,000	$48,000	$0	$0	$48,000

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Production L0 module: material and fixtures" continued

Notes

Cost:
We need 2 sets of fixtures + 1 spare.
Based on Engineering Estimate.
A set of fixture include detector to detector gluing, cable to detector gluing, cable to cable alignment, cable to hybrid gluing, cable cutting.
Cost of each set is ~16K.
Total cost is 48K$

1.1.3.2.4.2.3	L0 Module production	$10,197	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	25%	60 hrs	0 days	Wed 3/17/04	Tue 4/27/04
13	MechTechSF	100%	240 hrs	0 days	Wed 3/17/04	Tue 4/27/04
15	CMMProgrammerSF	10%	24 hrs	0 days	Wed 3/17/04	Tue 4/27/04
16	PostDocU	50%	120 hrs	0 days	Wed 3/17/04	Tue 4/27/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	25%	$2,541	$0	$0	$2,541
13	MechTechSF	100%	$6,960	$0	$0	$6,960
15	CMMProgrammerSF	10%	$696	$0	$0	$696
16	PostDocU	50%	$0	$0	$0	$0

Notes

Schedule:
We assume a rate of 3 L0 modules a day => ~30 days (need 72 modules, we'll build ~90)
Labor:
one full time technician needed.
All other personnel are for support.

1.1.3.2.4.2.4	Project Pacing: L0 module production	$0	0	0
1.1.3.2.4.2.5	L0 Production Modules Available	$0	0	0
1.1.3.2.4.2.6	L0 Production Modules Complete	$0	0	0
1.1.3.3	**Outer layer modules**	**$453,456**	**0**	**0**

Notes

It consists of 2 sensors glued together "head-on". On top of one sensor one hybrid and one pitch adapter is also glued. Module is wirebonded and put on a G-10 frame for testing.
Need **882** modules for the project.

1.1.3.3.1	**Outer Layers Module Prototype**	**$114,439**	**0**	**0**

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.3.3.1.1	Prototype Module: fixtures design	$33,270	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish
8	ElecEngF	10%	48 hrs	0 days	Wed 1/30/02	Tue 4/23/02
9	ElecTechF	10%	48 hrs	0 days	Wed 1/30/02	Tue 4/23/02
10	DesignerSF	75%	360 hrs	0 days	Wed 1/30/02	Tue 4/23/02
11	MechEngSF	75%	360 hrs	0 days	Wed 1/30/02	Tue 4/23/02
13	MechTechSF	5%	24 hrs	0 days	Wed 1/30/02	Tue 4/23/02
16	PostDocU	50%	240 hrs	0 days	Wed 1/30/02	Tue 4/23/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	ElecEngF	10%	$2,446	$0	$2,446	$0
9	ElecTechF	10%	$1,152	$0	$1,152	$0
10	DesignerSF	75%	$13,730	$0	$13,730	$0
11	MechEngSF	75%	$15,246	$0	$15,246	$0
13	MechTechSF	5%	$696	$0	$696	$0
16	PostDocU	50%	$0	$0	$0	$0

Notes

Labor:
This is for fixture designing and also to get all other support material in place for prototype module construction (support are: boxes, storage, designing G-10 frames for holding/testing modulesetc.)
Labor:
1. Mech engineer (75%) fixtures and supervision
2. Draftsman (75%) support for mech. engineer
3. postdoc (50%) support
4. mech. technician (5%) support
5. Elect. Engineer (10%) designing test boards
6. Elect. technician (10%) support

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.3.3.1.2	Prototype Module: material and fixtures	$22,500	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish
2	FNALR&D	0%	0 hrs	0 days	Tue 4/23/02	Tue 4/23/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	$22,500	$0	$22,500	$0

Notes

Schedule:
These are the fixtures for prototype module construction in summer 2002.
Cost:
1. detector/detector alignment fixtures (5K each)
2. hybrid/pitch adapter gluing fixture (3k each)
3. wirebonding fixture (2k each)
4. testing mechanical setup (2k each) [*2]
5. G-10 frames (0.025k each) [*180]
6. miscellanea material 4k

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.3.3.1.3	Prototype Module: Assembling	$27,535	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
7	PhysicistF	25%	120 hrs	0 days	Tue 8/6/02	Tue 10/29/02
10	DesignerSF	20%	96 hrs	0 days	Tue 8/6/02	Tue 10/29/02
11	MechEngSF	25%	120 hrs	0 days	Tue 8/6/02	Tue 10/29/02
13	MechTechSF	75%	360 hrs	0 days	Tue 8/6/02	Tue 10/29/02
14	WirebonderSF	50%	240 hrs	0 days	Tue 8/6/02	Tue 10/29/02
15	CMMProgrammerSF	10%	48 hrs	0 days	Tue 8/6/02	Tue 10/29/02
16	PostDocU	10%	48 hrs	0 days	Tue 8/6/02	Tue 10/29/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PhysicistF	25%	$0	$0	$0	$0
10	DesignerSF	20%	$3,661	$0	$0	$3,661
11	MechEngSF	25%	$5,082	$0	$0	$5,082
13	MechTechSF	75%	$10,440	$0	$0	$10,440
14	WirebonderSF	50%	$6,960	$0	$0	$6,960
15	CMMProgrammerSF	10%	$1,392	$0	$0	$1,392
16	PostDocU	10%	$0	$0	$0	$0

Notes

Schedule:
30 modules to be built. We assume 0.5 modules/day for the prototypes.
Labor:
1. postdoc (75%) support
2. mech. technician (50%) gluing/aligning
3. wirebonder (50%)
4. mech. technician (25%) for miscellanea (boxes, storage etc.)
5. mech. engineer (25%) support
6. draftsman (20%) for miscellanea boxes, storage, modifications to fixtures etc.
7. scientist (25%) support

1.1.3.3.1.4	Prototype Module testing	$3,598	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
7	PhysicistF	50%	240 hrs	0 days	Tue 8/13/02	Tue 11/5/02
8	ElecEngF	10%	48 hrs	0 days	Tue 8/13/02	Tue 11/5/02
9	ElecTechF	10%	48 hrs	0 days	Tue 8/13/02	Tue 11/5/02
16	PostDocU	25%	120 hrs	0 days	Tue 8/13/02	Tue 11/5/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PhysicistF	50%	$0	$0	$0	$0
8	ElecEngF	10%	$2,446	$0	$0	$2,446
9	ElecTechF	10%	$1,152	$0	$0	$1,152
16	PostDocU	25%	$0	$0	$0	$0

Notes

This for testing modules. It should be a short test, most of the testing is done at the stave level.

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Prototype Module testing" continued

Notes

This test is just to make sure the modules work before mounting on a stave. We estimate 1hrs/module at production. For this prototype setup there will be learning involved, but testing will easily keep up with module assembly.

1.1.3.3.1.5	Prototype modules available	$0	0	0
1.1.3.3.1.6	Prototype modules complete	$0	0	0
1.1.3.3.1.7	Prototype Module #2: Assembling	$27,535	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
7	PhysicistF	25%	120 hrs	0 days	Wed 4/23/03	Thu 7/17/03
10	DesignerSF	20%	96 hrs	0 days	Wed 4/23/03	Thu 7/17/03
11	MechEngSF	25%	120 hrs	0 days	Wed 4/23/03	Thu 7/17/03
13	MechTechSF	75%	360 hrs	0 days	Wed 4/23/03	Thu 7/17/03
14	WirebonderSF	50%	240 hrs	0 days	Wed 4/23/03	Thu 7/17/03
15	CMMProgrammerSF	10%	48 hrs	0 days	Wed 4/23/03	Thu 7/17/03
16	PostDocU	10%	48 hrs	0 days	Wed 4/23/03	Thu 7/17/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PhysicistF	25%	$0	$0	$0	$0
10	DesignerSF	20%	$3,661	$0	$0	$3,661
11	MechEngSF	25%	$5,082	$0	$0	$5,082
13	MechTechSF	75%	$10,440	$0	$0	$10,440
14	WirebonderSF	50%	$6,960	$0	$0	$6,960
15	CMMProgrammerSF	10%	$1,392	$0	$0	$1,392
16	PostDocU	10%	$0	$0	$0	$0

Notes

Schedule:
30 modules to be built. We assume 0.5 modules/day for the prototypes.
Labor:
1. postdoc (75%) support
2. mech. technician (50%) gluing/aligning
3. wirebonder (50%)
4. mech. technician (25%) for miscellanea (boxes, storage etc.)
5. mech. engineer (25%) support
6. draftsman (20%) for miscellanea boxes, storage, modifications to fixtures etc.
7. scientist (25%) support

1.1.3.3.1.8	Prototype modules # 2 available	$0	0	0
1.1.3.3.2	**Outer Layers Module Preproduction**	**$131,027**	**0**	**0**

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.3.3.2.1	Preproduction Module: fixtures design	$16,983	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
8	ElecEngF	10%	24 hrs	0 days	Wed 4/30/03	Wed 6/11/03
9	ElecTechF	10%	24 hrs	0 days	Wed 4/30/03	Wed 6/11/03
10	DesignerSF	75%	180 hrs	0 days	Wed 4/30/03	Wed 6/11/03
11	MechEngSF	75%	180 hrs	0 days	Wed 4/30/03	Wed 6/11/03
13	MechTechSF	10%	24 hrs	0 days	Wed 4/30/03	Wed 6/11/03
16	PostDocU	50%	120 hrs	0 days	Wed 4/30/03	Wed 6/11/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	ElecEngF	10%	$1,223	$0	$0	$1,223
9	ElecTechF	10%	$576	$0	$0	$576
10	DesignerSF	75%	$6,865	$0	$0	$6,865
11	MechEngSF	75%	$7,623	$0	$0	$7,623
13	MechTechSF	10%	$696	$0	$0	$696
16	PostDocU	50%	$0	$0	$0	$0

Notes

This is for fixture re-designing and also to get all other support inplace for productionmodule construction (support are: boxes, storage, designing G-10 frames for holding/testing modules, etc.)
Labor:
1. Mech engineer (75%) fixtures and supervision
2. Draftsman (75%) support for mech. engineer
3. postdoc (50%) support
4. mech. technician (5%) support
5. Elect. Engineer (10%) designing test boards
6. Elect. technician (10%) support

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.3.3.2.2	Preproduction Module: material and fixtures	$38,500	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	38,500	38,500	0 days	Thu 6/12/03	Thu 8/7/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	38,500	$38,500	$0	$0	$38,500

Notes

Schedule:
These are the fixtures for production of the module construction.
We assume that we can align 4 silicon pairs on a single fixture/day and 1 hybrid/pitch-adapter per day. In preproduction we assume we manufacture the FINAL production fixtures just in a smaller quantity than needed to sustain the final production rate.
Cost:
We assume to have to remake all fixtures used for the prototype phase.
1. fixtures for detector-detector (5k each) [*2]
2. fixture for hybrid/pitch to detector (3k each) [*4]
3. fixture for wirebonding modules (2k each) [*2]
4. testing mechanical setup (2k each) [*2]
5. G-10 frames (0.025k each) [*180]
6. miscellanea materials, boxes, storage cabinets (4K total)

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.3.3.2.3	Preproduction module: Assembling training	$20,556	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	25%	80 hrs	0 days	Fri 7/18/03	Fri 9/12/03
13	MechTechSF	125%	400 hrs	0 days	Fri 7/18/03	Fri 9/12/03
14	WirebonderSF	50%	160 hrs	0 days	Fri 7/18/03	Fri 9/12/03
15	CMMProgrammerSF	10%	32 hrs	0 days	Fri 7/18/03	Fri 9/12/03
16	PostDocU	25%	80 hrs	0 days	Fri 7/18/03	Fri 9/12/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	25%	$3,388	$0	$0	$3,388
13	MechTechSF	125%	$11,600	$0	$0	$11,600
14	WirebonderSF	50%	$4,640	$0	$0	$4,640
15	CMMProgrammerSF	10%	$928	$0	$0	$928
16	PostDocU	25%	$0	$0	$0	$0

Notes

We need to provide enough modules to sustain the ramp up stave production from June to October 2003 = 24 staves = 144 modules.

Production Rate is 8 modules/day on 2CMMs + a granite surface:
4 sensor-sensor joints/day on 2 CMMs
8 modules of hybrids& pitch adapters glued on a 3rd machine (these do not require alignment)
Two Mech. techs each 75% occupied making sensor-sensors joints and 25% gluing hybrids and pitch adapters

Rate for preproduction is ~2 modules/day - to allow extra time for ironing out details and getting setup, mechanical tech time is estimated at a half the prodcution need although the rate is only ~25% of production rate.

For wire bonding at a production we estimate one person could bond 6 modules.day.
For preproduction we assume 50% of a bonder can maintain the rate of 2 modules/day to allow some time for learning and streamlining the setups.

Labor:
1. mech. technician (100%)
2. mech tech support (25%)
3. wirebonder (50%)
4. postdoc (25%) support
5. mech engineer (25%) support
6. CMM programmer (10%)

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.3.3.2.4	Preproduction module: Assembling	$51,390	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	25%	200 hrs	0 days	Mon 10/6/03	Tue 3/2/04
13	MechTechSF	125%	1,000 hrs	0 days	Mon 10/6/03	Tue 3/2/04
14	WirebonderSF	50%	400 hrs	0 days	Mon 10/6/03	Tue 3/2/04
15	CMMProgrammerSF	10%	80 hrs	0 days	Mon 10/6/03	Tue 3/2/04

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Preproduction module: Assembling" continued

ID	Resource Name	Units	Work	Delay	Start	Finish
16	PostDocU	25%	200 hrs	0 days	Mon 10/6/03	Tue 3/2/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	25%	$8,470	$0	$0	$8,470
13	MechTechSF	125%	$29,000	$0	$0	$29,000
14	WirebonderSF	50%	$11,600	$0	$0	$11,600
15	CMMProgrammerSF	10%	$2,320	$0	$0	$2,320
16	PostDocU	25%	$0	$0	$0	$0

Notes

We need to provide enough modules to sustain the ramp up stave production from June to October 2003 = 24 staves = 144 modules.

Production Rate is 8 modules/day on 2CMMs + a granite surface:
4 sensor-sensor joints/day on 2 CMMs
8 modules of hybrids& pitch adapters glued on a 3rd machine (these do not require alignment)
Two Mech. techs each 75% occupied making sensor-sensors joints and 25% gluing hybrids and pitch adapters

Rate for preproduction is ~2 modules/day - to allow extra time for ironing out details and getting setup, mechanical tech time is estimated at a half the prodcution need although the rate is only ~25% of production rate.

For wire bonding at a production we estimate one person could bond 6 modules.day.
For preproduction we assume 50% of a bonder can maintain the rate of 2 modules/day to allow some time for learning and streamlining the setups.

Labor:
1. mech. technician (100%)
2. mech tech support (25%)
3. wirebonder (50%)
4. postdoc (25%) support
5. mech engineer (25%) support
6. CMM programmer (10%)

1.1.3.3.2.5 Preproduction Module testing $3,598 0 0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
7	PhysicistF	50%	240 hrs	0 days	Mon 10/13/03	Mon 1/12/04
8	ElecEngF	10%	48 hrs	0 days	Mon 10/13/03	Mon 1/12/04
9	ElecTechF	10%	48 hrs	0 days	Mon 10/13/03	Mon 1/12/04
16	PostDocU	50%	240 hrs	0 days	Mon 10/13/03	Mon 1/12/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PhysicistF	50%	$0	$0	$0	$0
8	ElecEngF	10%	$2,446	$0	$0	$2,446
9	ElecTechF	10%	$1,152	$0	$0	$1,152

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Preproduction Module testing" continued

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	PostDocU	50%	$0	$0	$0	$0

Notes

This for testing modules. It should be a short test, most of the testing is done at the stave level.
This test is just to make sure the modules work before mounting on a stave. We estimate
1hrs/module at production. For this preproduction setup there will be learning involved,
but testing will easily keep up with module assembly.

1.1.3.3.2.6	Preproduction modules available	$0	0	0
1.1.3.3.2.7	Preproduction modules complete	$0	0	0
1.1.3.3.3	**Outer Layers Module Production**	**$207,991**	**0**	**0**
1.1.3.3.3.1	Production Module: fixtures design	$6,028	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
8	ElecEngF	10%	15.2 hrs	0 days	Mon 10/20/03	Thu 11/13/03
9	ElecTechF	10%	15.2 hrs	0 days	Mon 10/20/03	Thu 11/13/03
10	DesignerSF	25%	38 hrs	0 days	Mon 10/20/03	Thu 11/13/03
11	MechEngSF	50%	76 hrs	0 days	Mon 10/20/03	Thu 11/13/03
13	MechTechSF	5%	7.6 hrs	0 days	Mon 10/20/03	Thu 11/13/03
16	PostDocU	50%	76 hrs	0 days	Mon 10/20/03	Thu 11/13/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	ElecEngF	10%	$774	$0	$0	$774
9	ElecTechF	10%	$365	$0	$0	$365
10	DesignerSF	25%	$1,449	$0	$0	$1,449
11	MechEngSF	50%	$3,219	$0	$0	$3,219
13	MechTechSF	5%	$220	$0	$0	$220
16	PostDocU	50%	$0	$0	$0	$0

Notes

This is for fixture re-designing and also to get all other support in place for production module construction (support are: boxes, storage, designing G-10 frames for holding/testing modules, programming the CMM machines etc.)
Labor:
1. Mech engineer (25%)
2. Draftsman (50%)
3. mech. technician (5%)
4. Elect. Engineer (10%)
5. Elect. Technician (10%)
6. postdoc (50%)

1.1.3.3.3.2	Production modules: material and fixtures	$60,000	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	60,000	60,000	0 days	Mon 11/17/03	Tue 2/3/04

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Production modules: material and fixtures" continued

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	60,000	$60,000	$0	$0	$60,000

Notes

Cost:
We assume a similar final design for the fixture and small modifications of the pre-production fixtures in quantity suitable for the production rate.
We assume that we can align 4 silicon pairs on a single fixture/day and
1 hybrid/pitch-adapter per day on a single fixture.
1. fixtures for detector-detector (5k each) [*1] assume we order one more for production
2. fixture for hybrid/pitch to detector (3k each) [*8]
3. fixture for wirebonding modules (2k each) [*2]
4. testing mechanical setup (2k each) [*0] we don't need extra for production
5. G-10 frames (0.025k each) [*750]
6. miscellanea materials, boxes, storage cabinets (8K total)

1.1.3.3.3.3 Production Modules: Assembling $138,366 0 0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
7	PhysicistF	25%	300 hrs	0 days	Wed 4/21/04	Fri 11/19/04
11	MechEngSF	10%	120 hrs	0 days	Wed 4/21/04	Fri 11/19/04
13	MechTechSF	250%	3,000 hrs	0 days	Wed 4/21/04	Fri 11/19/04
14	WirebonderSF	133%	1,596 hrs	0 days	Wed 4/21/04	Fri 11/19/04
16	PostDocU	75%	900 hrs	0 days	Wed 4/21/04	Fri 11/19/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PhysicistF	25%	$0	$0	$0	$0
11	MechEngSF	10%	$5,082	$0	$0	$5,082
13	MechTechSF	250%	$87,000	$0	$0	$87,000
14	WirebonderSF	133%	$46,284	$0	$0	$46,284
16	PostDocU	75%	$0	$0	$0	$0

Notes

Schedule:
Production Rate is 8 modules/day on 2CMMs + a granite surface:
4 sensor-sensor joints/day on 2 CMMs
8 modules of hybrids& pitch adapters glued on a 3rd machine (these do not require alignment)
Two Mech. techs each 75% occupied making sensor-sensors joints and 25% gluing hybrids and pitch adapters

For wirebonding we estimate 1 person at 100% could bond 6 modules/day.
For each module there are 4 sets of bonds: Si-Si, Si to Pitch adapter,
PA to chips and hybrid to test board.
To maintain a rate of 8 modules/dat we need 1.33 wirebonders.

For 200 staves we need 1200 modules. At a rate of 8/ day this is 150 days.

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Production Modules: Assembling" continued

Notes

Labor:
1. mech technician (200%)
2. wirebonder (133%)
3. Scientist (25%) support
4. mech engineer (10%) support
5. technician specialist (25%) support
6. mech technician (50%) mechanical support
7. postdoc (75%) support

1.1.3.3.3.4	Production Module testing	$3,598	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
7	PhysicistF	50%	240 hrs	0 days	Wed 4/28/04	Thu 7/22/04
8	ElecEngF	10%	48 hrs	0 days	Wed 4/28/04	Thu 7/22/04
9	ElecTechF	10%	48 hrs	0 days	Wed 4/28/04	Thu 7/22/04
16	PostDocU	50%	240 hrs	0 days	Wed 4/28/04	Thu 7/22/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PhysicistF	50%	$0	$0	$0	$0
8	ElecEngF	10%	$2,446	$0	$0	$2,446
9	ElecTechF	10%	$1,152	$0	$0	$1,152
16	PostDocU	50%	$0	$0	$0	$0

Notes

This for testing modules. It should be a short test, most of the testing is done at the stave level.
This test is just to make sure the modules work before mounting on a stave. We estimate
1hrs/module at production. For this preproduction setup there will be learning involved,
but testing will easily keep up with module assembly.

1.1.3.3.3.5	Project pacing: Production module assembly	$0	0	0

Notes

Added 50 days of floating contingency on the module assembly task.

1.1.3.3.3.6	Production modules available	$0	0	0
1.1.3.3.3.7	Module Production complete	$0	0	0
1.1.3.4	**Outer layer Staves**	**$972,338**	**0**	**0**
1.1.3.4.1	**Outer Layer Stave Prototype**	**$269,514**	**0**	**0**
1.1.3.4.1.1	Prototype stave :Structural and cooling R&D	$106,716	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish
2	FNALR&D	0%	0 hrs	0 days	Mon 1/7/02	Mon 1/7/02
7	PhysicistF	25%	198 hrs	0 days	Mon 1/7/02	Fri 5/24/02
10	DesignerSF	100%	792 hrs	0 days	Mon 1/7/02	Fri 5/24/02

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Prototype stave :Structural and cooling R&D" continued

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	100%	792 hrs	0 days	Mon 1/7/02	Fri 5/24/02
13	MechTechSF	100%	792 hrs	0 days	Mon 1/7/02	Fri 5/24/02
16	PostDocU	50%	396 hrs	0 days	Mon 1/7/02	Fri 5/24/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	$20,000	$0	$20,000	$0
7	PhysicistF	25%	$0	$0	$0	$0
10	DesignerSF	100%	$30,207	$0	$30,207	$0
11	MechEngSF	100%	$33,541	$0	$33,541	$0
13	MechTechSF	100%	$22,968	$0	$22,968	$0
16	PostDocU	50%	$0	$0	$0	$0

Notes

Cost:
we estimated here the cost for parts and fixtures to test various concepts and materials and to sustain a minimum R&D effort on these important issues.
Labor:
includes all labor needed to come up with the final design of the stave and fixtures to build staves.

1.1.3.4.1.2 Prototype Stave Design complete $0 0 0

Notes

Both the stave and fixtures.

1.1.3.4.1.3 Prototype Stave: material and fixtures $66,000 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish
2	FNALR&D	0%	0 hrs	0 days	Fri 5/24/02	Fri 5/24/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	$66,000	$0	$66,000	$0

Notes

Schedule:
This is the time needed at the machine shop to prepare all fixtures. It also includes the time needed for assembling, inspecting atc. the fixtures. Some fixture will require more time but we assume here that we get at least 1 fixture for flavour in order to start the assembling process.
Cost:
1. mecahnical stave related material and intermediate fixtures (7k total)
2. mechanical stave core assembly fixture (5k total)
3. laminating the bus cable fixture (5k)
5. One set of axial and stereo module alignment fixtures (10k each=20k)
6. stave wirebonding fixture (3k each) [*2]
7. stave inspection fixture (3k each)
8. stave storage boxes (0.5 each) [*20]
9. miscellanea material, testing boxes, storage cabinets etc. (10k total)

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.3.4.1.4	Prototype Stave: mechanical core construction	$5,174	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	25%	40 hrs	0 days	Mon 7/29/02	Fri 8/23/02
13	MechTechSF	75%	120 hrs	0 days	Mon 7/29/02	Fri 8/23/02
16	PostDocU	10%	16 hrs	0 days	Mon 7/29/02	Fri 8/23/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	25%	$1,694	$0	$0	$1,694
13	MechTechSF	75%	$3,480	$0	$0	$3,480
16	PostDocU	10%	$0	$0	$0	$0

Notes

This is to prepare a few (~ 5) staves cores with the prototype design and mechanical parts (bus cables) in preparation for electrical core production.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.3.4.1.5	Prototype Stave: electrical core construction	$10,348	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	25%	80 hrs	0 days	Tue 9/10/02	Mon 11/4/02
13	MechTechSF	75%	240 hrs	0 days	Tue 9/10/02	Mon 11/4/02
16	PostDocU	10%	32 hrs	0 days	Tue 9/10/02	Mon 11/4/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	25%	$3,388	$0	$0	$3,388
13	MechTechSF	75%	$6,960	$0	$0	$6,960
16	PostDocU	10%	$0	$0	$0	$0

Notes

This is to prepare (~30) stave cores with electrical parts (bus cables)
as part of the electrical stave prototypes milestone.
Schedule:
The start date is driven by the availability of the prototype bus cable. The end date is drivern
by being ready for stave prototype construction when all the other parts are ready.
Labor:
1. Mech Tech Specialist (50%) laminating CF sheets, gluing the stave on the mold
2. Mech Technician (25%) Preparing parts.
3. Mech Engineer (25%) Support
4. Research Associate (10%) Support

1.1.3.4.1.6	Prototype Stave: Electrical Cores available	$0	0	0
1.1.3.4.1.7	Prototype Stave: mechanical testing	$16,056	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	25%	160 hrs	0 days	Mon 8/26/02	Wed 12/18/02
13	MechTechSF	25%	160 hrs	0 days	Mon 8/26/02	Wed 12/18/02
15	CMMProgrammerSF	25%	160 hrs	0 days	Mon 8/26/02	Wed 12/18/02
16	PostDocU	25%	160 hrs	0 days	Mon 8/26/02	Wed 12/18/02

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Prototype Stave: mechanical testing" continued

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	25%	$6,776	$0	$0	$6,776
13	MechTechSF	25%	$4,640	$0	$0	$4,640
15	CMMProgrammerSF	25%	$4,640	$0	$0	$4,640
16	PostDocU	25%	$0	$0	$0	$0

Notes

This is all those tests aimed at making sure that the design and assembling procedures are within our mechanical specs.

1.1.3.4.1.8	Contingency on Prototype Stave Construction	$0	0	0
1.1.3.4.1.9	Ready to begin Prototype Electrical Stave Construction	$0	0	0
1.1.3.4.1.10	Prototype Stave: electrical assembly	$23,016	0	1

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	50%	160 hrs	0 days	Wed 9/25/02	Tue 11/19/02
13	MechTechSF	75%	240 hrs	0 days	Wed 9/25/02	Tue 11/19/02
14	WirebonderSF	50%	160 hrs	0 days	Wed 9/25/02	Tue 11/19/02
15	CMMProgrammerSF	50%	160 hrs	0 days	Wed 9/25/02	Tue 11/19/02
16	PostDocU	10%	32 hrs	0 days	Wed 9/25/02	Tue 11/19/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	50%	$6,776	$0	$0	$6,776
13	MechTechSF	75%	$6,960	$0	$0	$6,960
14	WirebonderSF	50%	$4,640	$0	$0	$4,640
15	CMMProgrammerSF	50%	$4,640	$0	$0	$4,640
16	PostDocU	10%	$0	$0	$0	$0

Notes

Schedule:
The beginning of this task is driven by having prototype modules and bus cables available. We assume it will take 2 weeks to make the 1st prototype electrical stave.
We are buying enough prototype parts to make 5 electrical staves.
and the duration of 40 days is to make 5 staves.
Labor:
1. Mech Technician (50%) gluing/aligning modules on staves
2. Mech Technician (50%) bonding
3. Mech Tech Specialist (25%) overseeing, troubleshooting etc.
4. Research Associate (50%) Support
5. Mech. Engineer (50%) Support
6. CMM programmer (50%)

1.1.3.4.1.11	Prototype Stave: electrical evaluation and Radiation Tests	$9,594	0	1

ID	Resource Name	Units	Work	Delay	Start	Finish
7	PhysicistF	50%	240 hrs	0 days	Wed 10/9/02	Wed 1/8/03
8	ElecEngF	25%	120 hrs	0 days	Wed 10/9/02	Wed 1/8/03
12	ElecTechSF	25%	120 hrs	0 days	Wed 10/9/02	Wed 1/8/03

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Prototype Stave: electrical evaluation and Radiation Tests" continued

ID	Resource Name	Units	Work	Delay	Start	Finish
16	PostDocU	50%	240 hrs	0 days	Wed 10/9/02	Wed 1/8/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PhysicistF	50%	$0	$0	$0	$0
8	ElecEngF	25%	$6,114	$0	$0	$6,114
12	ElecTechSF	25%	$3,480	$0	$0	$3,480
16	PostDocU	50%	$0	$0	$0	$0

Notes

Labor:
This is the stave testing crew at FNAL.
For the production we estimated based on a total of 4 FTE postdocs + 1 FTE scientist + 0.5 FTE electrical techician (for repair) for all the testing of modules and staves.
Module testing alone is estimated at 50% of a postdoc and 50% of a scientist
plus 25% of an electrical tech and engineer.
For this prototype stave testing we estimate needing
2 postdocs at 50% each
1 physicist 50%
an electrical tech and an electrical engineer for consultation at 25% each.

1.1.3.4.1.12 Prototype Stave #1 available $0 0 0

Notes

We assume it will take 2 weeks (10d) to put all the parts together to make the first prototype stave.

1.1.3.4.1.13 Prototype #2 Stave: electrical assembly $23,016 0 0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	50%	160 hrs	0 days	Wed 4/30/03	Wed 6/25/03
13	MechTechSF	75%	240 hrs	0 days	Wed 4/30/03	Wed 6/25/03
14	WirebonderSF	50%	160 hrs	0 days	Wed 4/30/03	Wed 6/25/03
15	CMMProgrammerSF	50%	160 hrs	0 days	Wed 4/30/03	Wed 6/25/03
16	PostDocU	10%	32 hrs	0 days	Wed 4/30/03	Wed 6/25/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	50%	$6,776	$0	$0	$6,776
13	MechTechSF	75%	$6,960	$0	$0	$6,960
14	WirebonderSF	50%	$4,640	$0	$0	$4,640
15	CMMProgrammerSF	50%	$4,640	$0	$0	$4,640
16	PostDocU	10%	$0	$0	$0	$0

Notes

Schedule:
The beginning of this task is driven by having prototype #2 modules available.
This is the same labor and cost as Prototype #1.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.3.4.1.14	Prototype #2 Stave: electrical testing and Rad. Tests	$9,594	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
7	PhysicistF	50%	240 hrs	0 days	Wed 5/14/03	Thu 8/7/03
8	ElecEngF	25%	120 hrs	0 days	Wed 5/14/03	Thu 8/7/03
12	ElecTechSF	25%	120 hrs	0 days	Wed 5/14/03	Thu 8/7/03
16	PostDocU	50%	240 hrs	0 days	Wed 5/14/03	Thu 8/7/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PhysicistF	50%	$0	$0	$0	$0
8	ElecEngF	25%	$6,114	$0	$0	$6,114
12	ElecTechSF	25%	$3,480	$0	$0	$3,480
16	PostDocU	50%	$0	$0	$0	$0

Notes

Labor:
This is ALL the electrical testing crew at FNAL. We don't divide it up between hybrid, modules, staves and burn-in stave parts. All SiDet electrical testing (up to the Stave) is considered here in terms of labor. The prototype effort is estimated based on a total of 4 FTE postdocs + 1 FTE scientist + 0.5 FTE electrical techician (for repair) for the PRODUCTION.

1.1.3.4.1.15	Prototype #2 Stave available	$0	0	0

Notes

We assume it will take 2 weeks (10d) to put all the parts together to make the first prototype stave.

1.1.3.4.2	**Outer Layer Stave Preproduction**	**$441,872**	**0**	**0**

Notes

This part also contains all material cost for the production.

1.1.3.4.2.1	Production Stave: final design	$35,096	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
10	DesignerSF	100%	400 hrs	0 days	Wed 5/14/03	Thu 7/24/03
11	MechEngSF	100%	400 hrs	0 days	Wed 5/14/03	Thu 7/24/03
13	MechTechSF	25%	100 hrs	0 days	Wed 5/14/03	Thu 7/24/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	100%	$15,256	$0	$0	$15,256
11	MechEngSF	100%	$16,940	$0	$0	$16,940
13	MechTechSF	25%	$2,900	$0	$0	$2,900

Notes

This is the final design of the mechanical stave and takes advantage of all possible tests done on the prototype staves.

1.1.3.4.2.2	Production Stave: material and fixtures	$276,750	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	276,750	276,750	0 days	Fri 7/25/03	Fri 9/19/03

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Production Stave: material and fixtures" continued

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	276,750	$276,750	$0	$0	$276,750

Notes

This is the time needed at the machine shop to prepare all fixtures for production.
Material etc. could be purchaised in advance.
Cost:
We assume we re-do all fixtures in number adequate to sustain production.
1. mechanical stave related material and intermediate fixtures (120.75k total)
2. mechanical stave core assembly fixture (5k total) [*2]
3. laminating the bus cable fixture (3k) [*4]
4. axial and stereo module alignment fixtures (15k each=30k) [*2]
5. stave wirebonding fixture (3k each) [*2]
6. stave inspection fixture (3k each)
7. stave storage boxes (0.5 each) [*100]
8. miscellanea material, testing boxes, storage cabinets etc. (15k total)

1.1.3.4.2.3 Preproduction Stave: training mechanical construction $14,598 0 0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	5%	16 hrs	0 days	Fri 7/25/03	Fri 9/19/03
13	MechTechSF	150%	480 hrs	0 days	Fri 7/25/03	Fri 9/19/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	5%	$678	$0	$0	$678
13	MechTechSF	150%	$13,920	$0	$0	$13,920

Notes

This is to train 2 more technicians to build mechanical staves.
This covers time to learn how to use the fixtures and to come
up to speed in the sidet environment.

Schedule:
The start date is driven by having them trained for the start of preproduction.
Labor:
1. Mech. tech = 1 lead tech and 2 learning the job all at 50% time each preparing parts and assembling
2. Mech Engineer (5%) support

1.1.3.4.2.4 Preproduction Stave: mechanical construction $26,588 0 0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	25%	80 hrs	0 days	Mon 9/22/03	Fri 11/14/03
13	MechTechSF	250%	800 hrs	0 days	Mon 9/22/03	Fri 11/14/03
16	PostDocU	50%	160 hrs	0 days	Mon 9/22/03	Fri 11/14/03

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Preproduction Stave: mechanical construction" continued

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	25%	$3,388	$0	$0	$3,388
13	MechTechSF	250%	$23,200	$0	$0	$23,200
16	PostDocU	50%	$0	$0	$0	$0

Notes

This is to prepare more than 40 mechanical staves with the final design.
Preproduction is to build 24 electrical stave. We should be able to sustain a production rate of ~3 mechanical staves per day. Here we assume that we have a ramp-up at an average rate of ~ 1 stave/day.
Schedule:
The start date is driven by having finished the final stave design and the readiness of the preproduction bus cable. Also we assume that we commit to the final fixture design during the previous tasks. This means that a certain number of identical fixtures need to be machined.
The end date is drivern by being ready for stave preproduction construction when all the
other preproduction parts are ready.
Labor:
1. Mech. tech (200%) preparing parts and assembling
2. Mech. tech Specialist (100%) this is for support and troubleshooting
3. Mech Engineer (25%) support
4. Research Associate (50%) support

1.1.3.4.2.5 Preproduction Stave: mechanicals available $0 0 0

Notes

This is mechanical staves

1.1.3.4.2.6 Preproduction Stave: mechanical testing $2,407 0 0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	10%	15.2 hrs	0 days	Mon 10/6/03	Thu 10/30/03
13	MechTechSF	20%	30.4 hrs	0 days	Mon 10/6/03	Thu 10/30/03
15	CMMProgrammerSF	20%	30.4 hrs	0 days	Mon 10/6/03	Thu 10/30/03
16	PostDocU	10%	15.2 hrs	0 days	Mon 10/6/03	Thu 10/30/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	10%	$644	$0	$0	$644
13	MechTechSF	20%	$882	$0	$0	$882
15	CMMProgrammerSF	20%	$882	$0	$0	$882
16	PostDocU	10%	$0	$0	$0	$0

Notes

This is all those remaining tests aimed at making sure that the design and assembling procedures are within our mechanical specs. Already extensive tests were made on the prototype stave. Nonetheless we need to re-verify for the production

1.1.3.4.2.7 Preproduction Stave: training electrical assembly $27,089 0 0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	10%	48 hrs	0 days	Fri 7/25/03	Fri 10/17/03

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Preproduction Stave: training electrical assembly " continued

ID	Resource Name	Units	Work	Delay	Start	Finish
13	MechTechSF	150%	720 hrs	0 days	Fri 7/25/03	Fri 10/17/03
14	WirebonderSF	20%	96 hrs	0 days	Fri 7/25/03	Fri 10/17/03
15	CMMProgrammerSF	10%	48 hrs	0 days	Fri 7/25/03	Fri 10/17/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	10%	$2,033	$0	$0	$2,033
13	MechTechSF	150%	$20,880	$0	$0	$20,880
14	WirebonderSF	20%	$2,784	$0	$0	$2,784
15	CMMProgrammerSF	10%	$1,392	$0	$0	$1,392

Notes

Schedule:
This is driven by being ready for when preproduction modules are available.
We will use leftover parts from the prototype stage along with dummy parts.
This covers time to learn how to use the fixtures and CMMs and to come
up to speed in the sidet environment.

1. Mech Technician each 50% (100%) learning to install/align modules on the stave
2. Mech Technician (20%) bonder
4. Mech. Engineer (5%) support
5. Mech Tech Specialist (50%) teaching and troubleshooting

1.1.3.4.2.8	Preproduction Stave: electrical assembly	$40,033	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	25%	140 hrs	0 days	Mon 10/20/03	Tue 2/3/04
13	MechTechSF	150%	840 hrs	0 days	Mon 10/20/03	Tue 2/3/04
14	WirebonderSF	50%	280 hrs	0 days	Mon 10/20/03	Tue 2/3/04
15	CMMProgrammerSF	10%	56 hrs	0 days	Mon 10/20/03	Tue 2/3/04
16	PostDocU	50%	280 hrs	0 days	Mon 10/20/03	Tue 2/3/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	25%	$5,929	$0	$0	$5,929
13	MechTechSF	150%	$24,360	$0	$0	$24,360
14	WirebonderSF	50%	$8,120	$0	$0	$8,120
15	CMMProgrammerSF	10%	$1,624	$0	$0	$1,624
16	PostDocU	50%	$0	$0	$0	$0

Notes

Schedule:
This is driven by having preproduction modules available.
We will use production bus cables, production sensors
preproduction hybrids (we call these preproduction modules)
and preproduction Miniportcards.

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Preproduction Stave: electrical assembly" continued

Notes

We want to build 24 electrical staves during the ramp up period.
Preproduction modules are produced at a rate of ~2/day, or 1/3 stave/day
This corresponds to 72 days for preproduction construction.
plus we allow 8 days after the parts are available to get everything ready = 80days total
Labor:
1. Mech Technician (100%) installing/aligning modules on the stave (2 techs at 50% each)
2. Mech Technician (50%) bonder
3. Mech Technician (25%) support, inspection etc.
4. Mech. Engineer (25%) support
5. Mech Tech Specialist (25%) support, troubleshooting
6. Research Associate (50%) support

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.3.4.2.9	Preproduction Stave: electricals available	$0	0	0

Notes

We assume it will take 2 weeks (10d) to put all the parts together to make the first prototype stave.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.3.4.2.10	Preproduction Stave: electrical testing (inc. Radiation tests)	$6,960	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
7	PhysicistF	50%	160 hrs	0 days	Mon 10/27/03	Tue 12/23/03
12	ElecTechSF	50%	160 hrs	0 days	Mon 10/27/03	Tue 12/23/03
13	MechTechSF	25%	80 hrs	0 days	Mon 10/27/03	Tue 12/23/03
16	PostDocU	200%	640 hrs	0 days	Mon 10/27/03	Tue 12/23/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PhysicistF	50%	$0	$0	$0	$0
12	ElecTechSF	50%	$4,640	$0	$0	$4,640
13	MechTechSF	25%	$2,320	$0	$0	$2,320
16	PostDocU	200%	$0	$0	$0	$0

Notes

Labor:
This is the stave electrical testing crew at FNAL
For preproduction
It is estimated to be a total of:
1. postdocs (200%)
2. scientist (50%) responsible for quality control
3. electrical techician (50%) for repair and minor support jobs
4. mech technician (25%) for repair/redo bonds

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.3.4.2.11	Evaluation of preproduction staves	$12,351	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
7	PhysicistF	20%	62.4 hrs	0 days	Mon 10/6/03	Mon 12/1/03
11	MechEngSF	25%	78 hrs	0 days	Mon 10/6/03	Mon 12/1/03
13	MechTechSF	50%	156 hrs	0 days	Mon 10/6/03	Mon 12/1/03

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Evaluation of preproduction staves" continued

ID	Resource Name	Units	Work	Delay	Start	Finish
15	CMMProgrammerSF	50%	156 hrs	0 days	Mon 10/6/03	Mon 12/1/03
16	PostDocU	50%	156 hrs	0 days	Mon 10/6/03	Mon 12/1/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PhysicistF	20%	$0	$0	$0	$0
11	MechEngSF	25%	$3,303	$0	$0	$3,303
13	MechTechSF	50%	$4,524	$0	$0	$4,524
15	CMMProgrammerSF	50%	$4,524	$0	$0	$4,524
16	PostDocU	50%	$0	$0	$0	$0

Notes

This is a mechanical evaluation from the point of view of giving the green light to start production. We assume here minor modification to the entire production structure. All this labor is ON TOP of the normal electrical testing labor.

1.1.3.4.2.12 Stave Production go-ahead $0 0 0

Notes

This milestone allows to proceed into stave production.

1.1.3.4.2.13 Preproduction Stave: electricals complete $0 0 0

Notes

We assume it will take 2 weeks (10d) to put all the parts together to make the first prototype stave.

1.1.3.4.2.14 Training for production stave testing $0 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish
16	PostDocU	300%	480 hrs	0 days	Tue 4/13/04	Mon 5/10/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	PostDocU	300%	$0	$0	$0	$0

1.1.3.4.3 Outer Layer Stave Production $260,953 0 0

1.1.3.4.3.1 Production Stave: modification to the final design $10,118 0 0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
10	DesignerSF	100%	152 hrs	0 days	Wed 12/3/03	Fri 1/2/04
11	MechEngSF	50%	76 hrs	0 days	Wed 12/3/03	Fri 1/2/04
13	MechTechSF	25%	38 hrs	0 days	Wed 12/3/03	Fri 1/2/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	100%	$5,797	$0	$0	$5,797
11	MechEngSF	50%	$3,219	$0	$0	$3,219
13	MechTechSF	25%	$1,102	$0	$0	$1,102

Notes

This is a contingency task to modify the final design of the stave (fixtures etc.) and takes advantage of the tests done on the pre-production phase.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.3.4.3.2	Production Stave: material and fixtures	$46,000	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	46,000	46,000	0 days	Wed 1/14/04	Mon 2/9/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	46,000	$46,000	$0	$0	$46,000

Notes

Cost:
we assume that some fixture (or equivalent parts) needs to be redone or modified:
1. set of stave mechanical fixtures (10K)
2. bus cable laminating fixture (6k)
3. stave alignment fixture (20k)
4. more/modify boxes for storing/testing (10k total)

1.1.3.4.3.3	prepare final fixtures and materials for production	$10,103	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	20%	30.4 hrs	0 days	Wed 2/11/04	Mon 3/8/04
13	MechTechSF	200%	304 hrs	0 days	Wed 2/11/04	Mon 3/8/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	20%	$1,287	$0	$0	$1,287
13	MechTechSF	200%	$8,816	$0	$0	$8,816

Notes

This task is for final preparations of all fixtures to sustain a production rate.

1.1.3.4.3.4	Production Stave: mechanical construction	$61,675	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	25%	158 hrs	0 days	Wed 3/10/04	Tue 6/29/04
13	MechTechSF	300%	1,896 hrs	0 days	Wed 3/10/04	Tue 6/29/04
16	PostDocU	50%	316 hrs	0 days	Wed 3/10/04	Tue 6/29/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	25%	$6,691	$0	$0	$6,691
13	MechTechSF	300%	$54,984	$0	$0	$54,984
16	PostDocU	50%	$0	$0	$0	$0

Notes

This is to prepare ~200 mechanical staves with the final design.
Schedule:
We estimate a production rate of 3 mechanical staves/day: 240 staves = 80days
This task should start as soon as the mechanical is shown to work and bus cables are available.
Labor:
Work is divided into 3 major sections:
a. preparation of parts (inlcudes bending peek tubing, cutting parts to size etc.)
b. laminating the bus cable to the carbon fiber sheet

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Production Stave: mechanical construction" continued

Notes

c. putting all parts in a mold and glue them
1. Mech. tech (200%) preparing parts and assembling
2. Mech. tech Specialist (100%) this is for support and troubleshooting
3. Mech Engineer (25%) support
4. Research Associate (50%) support

1.1.3.4.3.5	Production Stave: mechanicals available	$0	0	0
1.1.3.4.3.6	Contingency on Starting Stave Electrical assembly (40)	$0	0	0

Notes

This is a floating contingency on starting the electrical stave assembly task

1.1.3.4.3.7	Production Stave: electrical assembly	$106,956	0	0.5

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*
7	*PhysicistF*	*50%*	*548 hrs*	*0 days*	*Wed 5/5/04*	*Tue 11/16/04*
11	*MechEngSF*	*25%*	*274 hrs*	*0 days*	*Wed 5/5/04*	*Tue 11/16/04*
13	*MechTechSF*	*225%*	*2,466 hrs*	*0 days*	*Wed 5/5/04*	*Tue 11/16/04*
14	*WirebonderSF*	*50%*	*548 hrs*	*0 days*	*Wed 5/5/04*	*Tue 11/16/04*
15	*CMMProgrammerSF*	*25%*	*274 hrs*	*0 days*	*Wed 5/5/04*	*Tue 11/16/04*
16	*PostDocU*	*100%*	*1,096 hrs*	*0 days*	*Wed 5/5/04*	*Tue 11/16/04*

ID	*Resource Name*	*Units*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
7	*PhysicistF*	*50%*	*$0*	*$0*	*$0*	*$0*
11	*MechEngSF*	*25%*	*$11,604*	*$0*	*$0*	*$11,604*
13	*MechTechSF*	*225%*	*$71,514*	*$0*	*$0*	*$71,514*
14	*WirebonderSF*	*50%*	*$15,892*	*$0*	*$0*	*$15,892*
15	*CMMProgrammerSF*	*25%*	*$7,946*	*$0*	*$0*	*$7,946*
16	*PostDocU*	*100%*	*$0*	*$0*	*$0*	*$0*

Notes

Schedule:
The start date is driven by having production modules available.
We estimate that to build one stave, one mech tech would do the module alignment and
fraction of a second mechanical tech is needed for general support (mixing glue etc).
We will have two setups so that we could achieve a peak rate of 2 staves/day.
Module production (8 modules/day) limits average stave production to 1.33 staves/day.
We assume this rate and since we need 200 staves = 150 days.
To maintain this rate we estimate needing 1.5 technicians for gluing modules to
staves, plus 50% of another tech for support, along with 25% of a lead tech for supervision
and trouble shooting.

For Wireboning:
Each side of a stave has 3 sets of bonds for hybrid to bus cable and 1 set for MPC to bus cable.

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Production Stave: electrical assembly" continued

Notes

This is a total of 8 setups/stave. We estimate 1 person could maintain a rate of 3 staves/day. Stave production is limited to 1.33 staves/day so we estimate needing 50% of a wirebonder for stave production.

Labor:
1. Mech Technician (150%) installing/aligning modules on the stave
2. Mech Technician (50%) bonder
3. Mech Technician (50%) support, inspection etc.
4. Mech. Engineer (25%) support
5. Mech Tech Specialist (25%) support, troubleshooting
6. Research Associate (100%) support
7. Scientist (50%) supervision

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.3.4.3.8	Production Stave: electrical testing	$26,100	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
7	PhysicistF	100%	1,200 hrs	0 days	Wed 5/12/04	Tue 12/14/04
12	ElecTechSF	50%	600 hrs	0 days	Wed 5/12/04	Tue 12/14/04
13	MechTechSF	25%	300 hrs	0 days	Wed 5/12/04	Tue 12/14/04
16	PostDocU	350%	4,200 hrs	0 days	Wed 5/12/04	Tue 12/14/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PhysicistF	100%	$0	$0	$0	$0
12	ElecTechSF	50%	$17,400	$0	$0	$17,400
13	MechTechSF	25%	$8,700	$0	$0	$8,700
16	PostDocU	350%	$0	$0	$0	$0

Notes

This the stave electrical testing crew at FNAL. This is for staves and burn-in stave parts.
It is estimated to be a total of:
1. postdocs (350%) 3 from university, .5 from fnal
2. scientist (100%) responsible for quality control
3. electrical techician (50%) for repair and minor support jobs
4. mech technician (25%) bonder, for repair/redo bonds

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.3.4.3.9	Production Staves Available	$0	0	0
1.1.3.4.3.10	Contingency on finishing Stave production (40)	$0	0	0

Notes

This is contingency on finishing stave production and testing

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.3.4.3.11	Stave Production Complete	$0	0	0

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.4	**Beampipe**	**$45,799**	**0**	**0**

Notes

The beampipe is designed to be compatible with the old pipe (it has the same flanges to connect to the Tevatron beampipe). It is constructed from Beryllium for low mass, with short stainless steel sections on the end.

1.1.4.1	Beampipe available	$0	0	0

Notes

This will be put in as a milestone, estimated from the order date (about 15 Jun 02) plus 36 weeks (vender estimate, or was it 32?). pl

1.1.4.2	**Beampipe Supports**	**$24,371**	**0**	**0**
1.1.4.2.1	Project pacing: start beampipe support design	$0	0	0
1.1.4.2.2	Design prototype beampipe supports	$3,059	0	0.5

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*
10	*DesignerSF*	*25%*	*38 hrs*	*0 days*	*Mon 7/19/04*	*Thu 8/12/04*
11	*MechEngSF*	*25%*	*38 hrs*	*0 days*	*Mon 7/19/04*	*Thu 8/12/04*
16	*PostDocU*	*50%*	*76 hrs*	*0 days*	*Mon 7/19/04*	*Thu 8/12/04*

ID	*Resource Name*	*Units*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
10	*DesignerSF*	*25%*	*$1,449*	*$0*	*$0*	*$1,449*
11	*MechEngSF*	*25%*	*$1,609*	*$0*	*$0*	*$1,609*
16	*PostDocU*	*50%*	*$0*	*$0*	*$0*	*$0*

Notes

based on Run IIa experience

1.1.4.2.3	Fabricate prototype beampipe supports	$14,979	0.5	0.5

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*
2	*FNALR&D*	*0%*	*0 hrs*	*0 days*	*Fri 8/13/04*	*Fri 8/13/04*
11	*MechEngSF*	*5%*	*8 hrs*	*0 days*	*Mon 8/16/04*	*Mon 9/13/04*
13	*MechTechSF*	*100%*	*160 hrs*	*0 days*	*Mon 8/16/04*	*Mon 9/13/04*
16	*PostDocU*	*25%*	*40 hrs*	*0 days*	*Mon 8/16/04*	*Mon 9/13/04*

ID	*Resource Name*	*Units*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
2	*FNALR&D*	*0%*	*$10,000*	*$0*	*$0*	*$10,000*
11	*MechEngSF*	*5%*	*$339*	*$0*	*$0*	*$339*
13	*MechTechSF*	*100%*	*$4,640*	*$0*	*$0*	*$4,640*
16	*PostDocU*	*25%*	*$0*	*$0*	*$0*	*$0*

Notes

These are made from CF as in Run IIa and costs estimated from Run IIa experience.
Two types of supports are used to support the pipe in four places:
1) at either end of the spacetube (called 2-inch webs in Run IIa)
2) at either end of the ISL extension cylinder (called 4-inch webs in Run IIa)

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Fabricate prototype beampipe supports" continued

Notes

in the CF material. For the prototype round we only fabricate one set of each type.

1.1.4.2.4 Test prototype beampipe supports $6,334 0 0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	25%	40 hrs	0 days	Tue 9/14/04	Mon 10/11/04
13	MechTechSF	100%	160 hrs	0 days	Tue 9/14/04	Mon 10/11/04
16	PostDocU	50%	80 hrs	0 days	Tue 9/14/04	Mon 10/11/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	25%	$1,694	$0	$0	$1,694
13	MechTechSF	100%	$4,640	$0	$0	$4,640
16	PostDocU	50%	$0	$0	$0	$0

Notes

Use mockup beampipe to test concept for beampipe supports

1.1.4.3 Beampipe Supports (production) $21,428 0 0

1.1.4.3.1 Design final beampipe supports $1,449 0 0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
10	DesignerSF	25%	18 hrs	0 days	Tue 10/12/04	Fri 10/22/04
11	MechEngSF	25%	18 hrs	0 days	Tue 10/12/04	Fri 10/22/04
16	PostDocU	50%	36 hrs	0 days	Tue 10/12/04	Fri 10/22/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	25%	$687	$0	$0	$687
11	MechEngSF	25%	$762	$0	$0	$762
16	PostDocU	50%	$0	$0	$0	$0

Notes

This should go faster than prototype since we anticipate few if any changes

1.1.4.3.2 Fabricate final beampipe supports $19,979 0.5 0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	5%	8 hrs	0 days	Tue 10/26/04	Mon 11/22/04
13	MechTechSF	100%	160 hrs	0 days	Tue 10/26/04	Mon 11/22/04
16	PostDocU	50%	80 hrs	0 days	Tue 10/26/04	Mon 11/22/04
17	MANDS	15,000	15,000	0 days	Tue 10/26/04	Mon 11/22/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	5%	$339	$0	$0	$339
13	MechTechSF	100%	$4,640	$0	$0	$4,640
16	PostDocU	50%	$0	$0	$0	$0
17	MANDS	15,000	$15,000	$0	$0	$15,000

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Fabricate final beampipe supports" continued

Notes

We assume we need to remake the molds and the beampipe supports and that we make a full set this time (two sets of each type).

1.1.5 Support Mechanics $1,040,598 0 0

Notes

This section covers infrastucture, the support structures for the staves, barrels, L0, and transportation and installation at B0.
50% cont. is included on all costed items

1.1.5.1 Silicon Support Structures $849,032 0 0

Notes

This task covers the bulkheads which support the staves, the screens which attach the bulkheads to each other, the tube which supprts the barrels (spacetube in Run IIa) and the support structure for L0.

1.1.5.1.1 Bulkheads $200,128 0 0

Notes

This task consists of:
1. pre-prototype studies with G10 and leftover CF sheets
2. Construction of prototypes: 2 external and 2 internal CF bulkheads with precision Al (internal) and Al (external) mounting features.
3. fixtures for gluing the precision alignment pins to the bulkheads
4. Construction of production bulkheads: 2 external and 2 internal CF bulkheads with precision
Beryllium (internal) and AL (external) mounting features.

1.1.5.1.1.1 Bulkhead Prototype work $112,248 0 0

1.1.5.1.1.1.1 Bulkhead Initial Concept studies $23,825 0 0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*
2	*FNALR&D*	*0%*	*0 hrs*	*0 days*	*Mon 1/7/02*	*Mon 1/7/02*
10	*DesignerSF*	*10%*	*71.2 hrs*	*0 days*	*Mon 1/7/02*	*Fri 5/10/02*
11	*MechEngSF*	*50%*	*356 hrs*	*0 days*	*Mon 1/7/02*	*Fri 5/10/02*
15	*CMMProgrammerSF*	*5%*	*35.6 hrs*	*0 days*	*Mon 1/7/02*	*Fri 5/10/02*

ID	*Resource Name*	*Units*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
2	*FNALR&D*	*0%*	*$5,000*	*$0*	*$5,000*	*$0*
10	*DesignerSF*	*10%*	*$2,716*	*$0*	*$2,716*	*$0*
11	*MechEngSF*	*50%*	*$15,077*	*$0*	*$15,077*	*$0*
15	*CMMProgrammerSF*	*5%*	*$1,032*	*$0*	*$1,032*	*$0*

Notes

Studies in this item are with preprototype bulkheads made from G10 and leftover CF sheets
Cost estimate 5k$ for materials
Labor:
mostly engineer type labor.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.5.1.1.1.2	Bulkhead Prototype: Design	$14,741	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
10	DesignerSF	25%	120 hrs	0 days	Mon 5/13/02	Tue 8/6/02
11	MechEngSF	50%	240 hrs	0 days	Mon 5/13/02	Tue 8/6/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	25%	$4,577	$0	$4,119	$458
11	MechEngSF	50%	$10,164	$0	$9,148	$1,016

Notes

Cost:
This is to finalise the first prototype of a bulkhead design to test the concept.
Details of mounting hardware and fixturing will be included at this stage.
Detailed analysis of Bulkhead structure (FEA) will impact design.

1.1.5.1.1.1.3	Bulkhead Prototype: fabrication	$50,000	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
2	FNALR&D	0%	0 hrs	0 days	Tue 8/6/02	Tue 8/6/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	$50,000	$0	$50,000	$0

Notes

Cost:
We estimate the need for 2 CF bulkheads (inner and outer) plus a G-10 mockups.
Costs per estimate from engineers Greg Derylo and Youri Orlov April 18, 2002
CF materail $5k
fabrication of plates $5k
plate machining $5k
pins $5k
Assembly fixtures: $25k
Test fixtures $5k
G10 mockups

1.1.5.1.1.1.4	Bulkhead Prototype: assembly and testing	$23,683	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	50%	236 hrs	0 days	Thu 10/31/02	Thu 1/30/03
13	MechTechSF	50%	236 hrs	0 days	Thu 10/31/02	Thu 1/30/03
15	CMMProgrammerSF	50%	236 hrs	0 days	Thu 10/31/02	Thu 1/30/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	50%	$9,995	$0	$0	$9,995
13	MechTechSF	50%	$6,844	$0	$0	$6,844
15	CMMProgrammerSF	50%	$6,844	$0	$0	$6,844

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Bulkhead Prototype: assembly and testing" continued

Notes

This is the labor associated with gluing the precision pins to the bulkheads in correct locations.
The alignment and construction of the fixture will be performed on a CMM.
The stiffness of the bulkheads will be tested. Installationl and positioning in a barrel will also be tested.

1.1.5.1.1.2	**Bulkhead Production**	**$87,880**	**0**	**0**

1.1.5.1.1.2.1 Bulkhead: Final Design $12,878 0 0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
10	DesignerSF	50%	160 hrs	0 days	Thu 2/6/03	Wed 4/2/03
11	MechEngSF	50%	160 hrs	0 days	Thu 2/6/03	Wed 4/2/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	50%	$6,102	$0	$0	$6,102
11	MechEngSF	50%	$6,776	$0	$0	$6,776

Notes

Design will be modified as needed by the results of the tests

1.1.5.1.1.2.2 Bulkhead Final Design Complete $0 0 0

1.1.5.1.1.2.3 Bulkhead: fabrication $56,000 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	56,000	56,000	0 days	Thu 4/3/03	Fri 7/25/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	56,000	$56,000	$0	$0	$56,000

Notes

Cost estimate from engineers Greg Derylo and Youri Orlov April 18, 2002.
11k$ for CF material
5k$ for fabrication
5k$ for machining
10k$ for precision pins
25k$ assembly fixtures

Total = 56k$

1.1.5.1.1.2.4 Bulkhead: assembly, testing $19,002 0 0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	25%	120 hrs	0 days	Mon 7/28/03	Mon 10/20/03
13	MechTechSF	50%	240 hrs	0 days	Mon 7/28/03	Mon 10/20/03
15	CMMProgrammerSF	50%	240 hrs	0 days	Mon 7/28/03	Mon 10/20/03
16	PostDocU	50%	240 hrs	0 days	Mon 7/28/03	Mon 10/20/03

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Bulkhead: assembly, testing" continued

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	25%	$5,082	$0	$0	$5,082
13	MechTechSF	50%	$6,960	$0	$0	$6,960
15	CMMProgrammerSF	50%	$6,960	$0	$0	$6,960
16	PostDocU	50%	$0	$0	$0	$0

Notes

Labor:
This includes the labor for gluing the pins to the bulkheads and to test the quality of the bulkheads

1.1.5.1.1.2.5	Project Pacing: Bulkheads complete	$0	0	0
1.1.5.1.1.2.6	Bulkheads Complete	$0	0	0
1.1.5.1.2	**Barrel Mounts**	**$51,731**	**0**	**0**

Notes

The barrel mounts support the barrels inside the spacetube. They provide the alignment from barrel to barrel and to the spacetube.
Cost estimated from G. Derylo and Y. Orlov, April 18, 2002.
10k$ for prototype barrel mounts
15k$ for the production set of mounts.

1.1.5.1.2.1	**Barrel Mounts Prototypes**	**$29,109**	**0**	**0**
1.1.5.1.2.1.1	Prototype barrel mount Design	$12,775	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
10	DesignerSF	25%	104 hrs	0 days	Thu 9/5/02	Fri 11/15/02
11	MechEngSF	50%	208 hrs	0 days	Thu 9/5/02	Fri 11/15/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	25%	$3,967	$0	$0	$3,967
11	MechEngSF	50%	$8,809	$0	$0	$8,809

Notes

These support the barrels in the space tube. Design based on experience with SVX, SVX' an d SVXII.

1.1.5.1.2.1.2	Prototype barrel mount fabrication	$10,000	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
2	FNALR&D	0%	0 hrs	0 days	Fri 11/29/02	Fri 11/29/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	$10,000	$0	$0	$10,000

Notes

Cost est. from G. Derylo, Y.Orlov April 18, 2002.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.5.1.2.1.3	Prototype barrel mount: assembly and testing	$6,334	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	25%	40 hrs	0 days	Thu 2/6/03	Wed 3/5/03
13	MechTechSF	25%	40 hrs	0 days	Thu 2/6/03	Wed 3/5/03
15	CMMProgrammerSF	75%	120 hrs	0 days	Thu 2/6/03	Wed 3/5/03
16	PostDocU	50%	80 hrs	0 days	Thu 2/6/03	Wed 3/5/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	25%	$1,694	$0	$0	$1,694
13	MechTechSF	25%	$1,160	$0	$0	$1,160
15	CMMProgrammerSF	75%	$3,480	$0	$0	$3,480
16	PostDocU	50%	$0	$0	$0	$0

1.1.5.1.2.2	**Barrel Mount Production**	**$22,622**	**0**	**0**
1.1.5.1.2.2.1	Barrel mount design modifications	$1,288	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
10	DesignerSF	10%	16 hrs	0 days	Thu 4/3/03	Wed 4/30/03
11	MechEngSF	10%	16 hrs	0 days	Thu 4/3/03	Wed 4/30/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	10%	$610	$0	$0	$610
11	MechEngSF	10%	$678	$0	$0	$678

Notes

This task covers modifications identified with prototype mounts.

1.1.5.1.2.2.2	Production Barrel mount Fabrication	$15,000	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	15,000	15,000	0 days	Thu 5/1/03	Thu 5/29/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	15,000	$15,000	$0	$0	$15,000

Notes

Cost estimated from G. Derylo and Y. Orlov, April 18,2002.

1.1.5.1.2.2.3	Production barrel mount: assembly	$6,334	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	25%	40 hrs	0 days	Fri 5/30/03	Thu 6/26/03
13	MechTechSF	25%	40 hrs	0 days	Fri 5/30/03	Thu 6/26/03
15	CMMProgrammerSF	75%	120 hrs	0 days	Fri 5/30/03	Thu 6/26/03
16	PostDocU	50%	80 hrs	0 days	Fri 5/30/03	Thu 6/26/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	25%	$1,694	$0	$0	$1,694

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Production barrel mount: assembly" continued

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
13	MechTechSF	25%	$1,160	$0	$0	$1,160
15	CMMProgrammerSF	75%	$3,480	$0	$0	$3,480
16	PostDocU	50%	$0	$0	$0	$0

1.1.5.1.3 Outer screens $94,284 0 0

Notes

This task covers
1) the Inner screen which is glued to the bulkheads before stave installation begins.
2) the alignment fixtures for holding the bulkheads before the screen is glued
3) the outer screens which are glued the the barrel after stave installation is complete.

1.1.5.1.3.1 Outer Screens Prototype $43,845 0 0

1.1.5.1.3.1.1 Design outer screen and mounts $9,827 0 0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
10	DesignerSF	50%	80 hrs	0 days	Thu 2/6/03	Wed 3/5/03
11	MechEngSF	100%	160 hrs	0 days	Thu 2/6/03	Wed 3/5/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	50%	$3,051	$0	$0	$3,051
11	MechEngSF	100%	$6,776	$0	$0	$6,776

Notes

This is the outer screen of the barrel. It holds the relative alignment of the bulkheads after the axle is removed and provides protection for the staves.

1.1.5.1.3.1.2 Barrel outer screen prototype fabrication $26,000 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish
2	FNALR&D	0%	0 hrs	0 days	Wed 3/5/03	Wed 3/5/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	$26,000	$0	$0	$26,000

Notes

This is the cost to make a protoype set of outer screens for the outer barrel.
CF material - 4k$
Mandrils - 10k$
Fabrication costs - 8k$
Test fixtures - 4k$

Total = 26k$

1.1.5.1.3.1.3 Barrel outer screen mount fabrication $2,000 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish
2	FNALR&D	0%	0 hrs	0 days	Wed 3/5/03	Wed 3/5/03

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Barrel outer screen mount fabrication" continued

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	$2,000	$0	$0	$2,000

Notes

This is the fabrication the small parts that are glued to the bulkhead to provide a ledge for mounting the outer screen. The cost is estimated from similar parts in Run IIa.

1.1.5.1.3.1.4 Test outer screen and mounts $6,017 0 0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	25%	38 hrs	0 days	Thu 5/1/03	Wed 5/28/03
13	MechTechSF	50%	76 hrs	0 days	Thu 5/1/03	Wed 5/28/03
15	CMMProgrammerSF	50%	76 hrs	0 days	Thu 5/1/03	Wed 5/28/03
16	PostDocU	50%	76 hrs	0 days	Thu 5/1/03	Wed 5/28/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	25%	$1,609	$0	$0	$1,609
13	MechTechSF	50%	$2,204	$0	$0	$2,204
15	CMMProgrammerSF	50%	$2,204	$0	$0	$2,204
16	PostDocU	50%	$0	$0	$0	$0

Notes

This is the outer screen of the barrel. It must be able to hold the relative alignment of the bulkheads after the axle is removed and provides protection for the staves.

1.1.5.1.3.2 Outer Screens Production $50,439 0 0

1.1.5.1.3.2.1 Design final outer screen and mounts $6,439 0 0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
10	DesignerSF	50%	80 hrs	0 days	Fri 5/30/03	Thu 6/26/03
11	MechEngSF	50%	80 hrs	0 days	Fri 5/30/03	Thu 6/26/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	50%	$3,051	$0	$0	$3,051
11	MechEngSF	50%	$3,388	$0	$0	$3,388

Notes

Design of the final screen and mounts waits for the final bulkhead design to be complete and for the tests of the prototype screens and mounts.

1.1.5.1.3.2.2 Barrel outer screen production mount fabrication $4,000 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	4,000	4,000	0 days	Fri 6/27/03	Fri 7/25/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	4,000	$4,000	$0	$0	$4,000

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Barrel outer screen production mount fabrication" continued

Notes

This is the cost to make the production set of outer screen mounts for the outer barrel.

1.1.5.1.3.2.3	Barrel outer screen: production fabrication	$40,000	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	40,000	40,000	0 days	Fri 6/27/03	Fri 8/22/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	40,000	$40,000	$0	$0	$40,000

Notes

This is the cost to fabricate the screens, assuming we buy them rather than make them in house.
Estimate from G. Derylo and Y.Orlov April 18,2002
CF materials - 10k$
Mandrils - 15k$
Fabrication costs - 10k$
Fixturing - 5k$

Total = 40k$

1.1.5.1.4	**Inner Screens**	**$56,600**	**0**	**0**

Notes

The inner screens are glued to the bulkheads before stave installation begins. They hold the relative alignment of the bulkheads during stave installation and after removal form the stave installation fixture.

1.1.5.1.4.1	**Inner Screen Prototypes**	**$30,161**	**0**	**0**
1.1.5.1.4.1.1	Design Inner screen and mounts	$9,827	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
10	DesignerSF	50%	80 hrs	0 days	Wed 8/7/02	Wed 9/4/02
11	MechEngSF	100%	160 hrs	0 days	Wed 8/7/02	Wed 9/4/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	50%	$3,051	$0	$0	$3,051
11	MechEngSF	100%	$6,776	$0	$0	$6,776

Notes

The inner screen will be designed in conjunction with FEA simulations to determine desired properties.

1.1.5.1.4.1.2	Inner Screen prototype fabrication	$9,000	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
2	FNALR&D	0%	0 hrs	0 days	Wed 9/4/02	Wed 9/4/02

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Inner Screen prototype fabrication" continued

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	$9,000	$0	$0	$9,000

Notes

The inner screen is glued to the bulheads before stave installation and holds the relative bulkhead alignment.
Cost estimated by Derylo and Orlov April 2002
CF material = 1k
Mandril = 5k
CF fab = 2k
test fixtures = 1k
total = 9k

1.1.5.1.4.1.3 Barrel inner screen mount fabrication $5,000 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish
2	FNALR&D	0%	0 hrs	0 days	Wed 9/4/02	Wed 9/4/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	$5,000	$0	$0	$5,000

Notes

This are the mounts to be attached to the bulkhead for the inner screen.
This is a special mount which needs to be electrically insulated.

1.1.5.1.4.1.4 Test inner screen and mounts $6,334 0 0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	25%	40 hrs	0 days	Thu 10/3/02	Wed 10/30/02
13	MechTechSF	50%	80 hrs	0 days	Thu 10/3/02	Wed 10/30/02
15	CMMProgrammerSF	50%	80 hrs	0 days	Thu 10/3/02	Wed 10/30/02
16	PostDocU	50%	80 hrs	0 days	Thu 10/3/02	Wed 10/30/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	25%	$1,694	$0	$0	$1,694
13	MechTechSF	50%	$2,320	$0	$0	$2,320
15	CMMProgrammerSF	50%	$2,320	$0	$0	$2,320
16	PostDocU	50%	$0	$0	$0	$0

Notes

The inner screen must be able to hold the relative alignment of the bulkheads during stave installation

1.1.5.1.4.2 Inner Screens Production $26,439 0 0

1.1.5.1.4.2.1 Design final inner screen and mounts $6,439 0 0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
10	DesignerSF	50%	80 hrs	0 days	Fri 6/27/03	Fri 7/25/03

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Design final inner screen and mounts" continued

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	50%	80 hrs	0 days	Fri 6/27/03	Fri 7/25/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	50%	$3,051	$0	$0	$3,051
11	MechEngSF	50%	$3,388	$0	$0	$3,388

Notes

Design of the final screen and mounts waits for the final bulkhead design to be complete and for the tests of the prototype screens and mounts.

1.1.5.1.4.2.2 Barrel inner screen production mount fabrication $10,000 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	10,000	10,000	0 days	Mon 7/28/03	Fri 8/22/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	10,000	$10,000	$0	$0	$10,000

Notes

This is the cost to make the production set of inner screen mounts for the outer barrel.

1.1.5.1.4.2.3 Inner screen production fabrication $10,000 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	10,000	10,000	0 days	Mon 7/28/03	Fri 8/22/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	10,000	$10,000	$0	$0	$10,000

Notes

Costs estimated from Derylo and Orlov April, 2002
CF material -2k
Mandril - 5k
CF fabrication - 2k
testing fixtures - 1k
total = 10k

1.1.5.1.5 Bulkhead alignment fixture $30,048 0 0

1.1.5.1.5.1 Prototpe bulkhead alignment fixture $21,828 0 0

1.1.5.1.5.1.1 design prototype bulkhead alignment fixtures $12,878 0 0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
10	DesignerSF	50%	160 hrs	0 days	Thu 9/5/02	Wed 10/30/02
11	MechEngSF	50%	160 hrs	0 days	Thu 9/5/02	Wed 10/30/02

WBS	Name	Cost	M&S Cont.	Labor Cont.

"design prototype bulkhead alignment fixtures" continued

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	50%	$6,102	$0	$0	$6,102
11	MechEngSF	50%	$6,776	$0	$0	$6,776

1.1.5.1.5.1.2 Fabricate prototype fixture $5,000 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish
2	FNALR&D	0%	0 hrs	0 days	Wed 10/30/02	Wed 10/30/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	$5,000	$0	$0	$5,000

Notes

These are small parts that allow the bulkheads to be precisely positioned before gluing to the inner screen. Cost is estimated from similar parts used in Run IIa.

1.1.5.1.5.1.3 Test bulkhead alignment fixture $3,950 0 0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	10%	15.2 hrs	0 days	Thu 1/9/03	Wed 2/5/03
15	CMMProgrammerSF	75%	114 hrs	0 days	Thu 1/9/03	Wed 2/5/03
16	PostDocU	25%	38 hrs	0 days	Thu 1/9/03	Wed 2/5/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	10%	$644	$0	$0	$644
15	CMMProgrammerSF	75%	$3,306	$0	$0	$3,306
16	PostDocU	25%	$0	$0	$0	$0

1.1.5.1.5.2 Production fixture $8,220 0 0

1.1.5.1.5.2.1 Design production fixture $3,220 0 0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
10	DesignerSF	25%	40 hrs	0 days	Thu 2/6/03	Wed 3/5/03
11	MechEngSF	25%	40 hrs	0 days	Thu 2/6/03	Wed 3/5/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	25%	$1,526	$0	$0	$1,526
11	MechEngSF	25%	$1,694	$0	$0	$1,694

1.1.5.1.5.2.2 Fabricate production fixture $5,000 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	5,000	5,000	0 days	Thu 3/6/03	Wed 4/30/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	5,000	$5,000	$0	$0	$5,000

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Fabricate production fixture" continued

Notes

These are small parts that allow the bulkheads to be precisely positioned before gluing to the inner screen. Cost is estimated from similar parts used in Run IIa.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.5.1.6	**Outer Screen Installation Fixture**	**$22,878**	**0**	**0**

Notes

This fixture is used to install the outer screen on the barrel after stave installation is complete.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.5.1.6.1	**prototype screen installation fixture**	**$11,439**	**0**	**0**
1.1.5.1.6.1.1	Design Prototype screen installation fixture	$6,439	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
10	DesignerSF	50%	80 hrs	0 days	Thu 3/6/03	Wed 4/2/03
11	MechEngSF	50%	80 hrs	0 days	Thu 3/6/03	Wed 4/2/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	50%	$3,051	$0	$0	$3,051
11	MechEngSF	50%	$3,388	$0	$0	$3,388

Notes

This fixture holds the bulkheads whilie the inner screen is glued to them and
holds the barrels while the outer screen is glued to the bulkheads.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.5.1.6.1.2	Fabricate prototype screen installation fixture	$5,000	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
2	FNALR&D	0%	0 hrs	0 days	Wed 4/2/03	Wed 4/2/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	$5,000	$0	$0	$5,000

Notes

Cost est. from G. Derylo and Y.Orlov April 18, 2002.
This is the fixture that holds the outer screen in place while it is glued to the bulkheads.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.5.1.6.2	**production screen installation fixture**	**$11,439**	**0**	**0**
1.1.5.1.6.2.1	Design Production screen installation fixture	$6,439	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
10	DesignerSF	50%	80 hrs	0 days	Fri 6/27/03	Fri 7/25/03
11	MechEngSF	50%	80 hrs	0 days	Fri 6/27/03	Fri 7/25/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	50%	$3,051	$0	$0	$3,051
11	MechEngSF	50%	$3,388	$0	$0	$3,388

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Design Production screen installation fixture" continued

Notes

This covers time to modify prototype design

1.1.5.1.6.2.2 Fabricate production screen installation fixture $5,000 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	5,000	5,000	0 days	Mon 7/28/03	Fri 8/22/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	5,000	$5,000	$0	$0	$5,000

Notes

Cost est. from G. Derylo and Y.Orlov April 18, 2002.

1.1.5.1.7 Axle Removal Fixture $33,708 0 0

Notes

Once the outer screen is installed, the axle of the barrel assembly is extracted. This fixture supports the barrel during this process.

1.1.5.1.7.1 prototype axle fixture $22,420 0 0

1.1.5.1.7.1.1 Design Prototype axle removal fixture $9,253 0 0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
10	DesignerSF	50%	156 hrs	0 days	Thu 2/6/03	Tue 4/1/03
11	MechEngSF	25%	78 hrs	0 days	Thu 2/6/03	Tue 4/1/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	50%	$5,950	$0	$0	$5,950
11	MechEngSF	25%	$3,303	$0	$0	$3,303

Notes

This fixture holds the barrels while the axle is removed

1.1.5.1.7.1.2 Fabricate prototype screen installation fixture $10,000 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish
2	FNALR&D	0%	0 hrs	0 days	Wed 4/2/03	Wed 4/2/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	$10,000	$0	$0	$10,000

Notes

This is not a precision fixture

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.5.1.7.1.3	Test Prototype axle removal fixture	$3,167	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	25%	20 hrs	0 days	Fri 5/30/03	Thu 6/12/03
13	MechTechSF	100%	80 hrs	0 days	Fri 5/30/03	Thu 6/12/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	25%	$847	$0	$0	$847
13	MechTechSF	100%	$2,320	$0	$0	$2,320

Notes

1.1.5.1.7.2	**production axle fixture**	**$11,288**	**0**	**0**
1.1.5.1.7.2.1	Design Production axle removal fixture	$1,288	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	10%	16 hrs	0 days	Fri 6/13/03	Fri 7/11/03	$610	$0	$0	$610
11	MechEngSF	10%	16 hrs	0 days	Fri 6/13/03	Fri 7/11/03	$678	$0	$0	$678

Notes
This covers time to modify prototype design

1.1.5.1.7.2.2	Fabricate production axle removal fixture	$10,000	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	10,000	10,000	0 days	Mon 7/14/03	Mon 9/8/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	10,000	$10,000	$0	$0	$10,000

1.1.5.1.8	**Barrel into Spacetube Fixture**	**$38,012**	**0**	**0**

Notes
The barrel must be transported to the spacetube. This fixture will be used to carry the barrels and support the associated cables and cooling tubes.

1.1.5.1.8.1	**prototype fixture**	**$23,267**	**0**	**0**
1.1.5.1.8.1.1	Project Pacing: design barrel to spacetube fixture	$0	0	0
1.1.5.1.8.1.2	Design Prototype fixture	$9,253	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
10	DesignerSF	50%	156 hrs	0 days	Tue 11/18/03	Tue 1/20/04
11	MechEngSF	25%	78 hrs	0 days	Tue 11/18/03	Tue 1/20/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	50%	$5,950	$0	$0	$5,950

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Design Prototype fixture" continued

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	25%	$3,303	$0	$0	$3,303

Notes

This fixture supports the barrel and associated cables and cooling during installation into the spacetube

1.1.5.1.8.1.3	Fabricate prototype fixture	$10,000	0.5	0	

ID	Resource Name	Units	Work	Delay	Start	Finish
2	FNALR&D	0%	0 hrs	0 days	Wed 1/28/04	Wed 1/28/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	$10,000	$0	$0	$10,000

Notes

This is fixture which allows the completed barrel to be lifted and then lowered into the spacetube.
It is not a precision fixture and is larger than in Run IIa.

1.1.5.1.8.1.4	Test Prototype fixture	$4,014	0	0.5	

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	25%	40 hrs	0 days	Thu 3/25/04	Wed 4/21/04
13	MechTechSF	50%	80 hrs	0 days	Thu 3/25/04	Wed 4/21/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	25%	$1,694	$0	$0	$1,694
13	MechTechSF	50%	$2,320	$0	$0	$2,320

Notes

1.1.5.1.8.2	**production fixture**	**$14,745**	**0**	**0**
1.1.5.1.8.2.1	Design Production fixture	$4,745	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
10	DesignerSF	50%	80 hrs	0 days	Thu 4/22/04	Wed 5/19/04
11	MechEngSF	25%	40 hrs	0 days	Thu 4/22/04	Wed 5/19/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	50%	$3,051	$0	$0	$3,051
11	MechEngSF	25%	$1,694	$0	$0	$1,694

Notes

This covers time to modify prototype design

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.5.1.8.2.2	Fabricate production fixture	$10,000	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	10,000	10,000	0 days	Thu 5/20/04	Fri 7/16/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	10,000	$10,000	$0	$0	$10,000

Notes

This is fixture which allows the completed barrel to be lifted and then lowered into the spacetube.
It is not a precision fixture and is larger than in Run IIa.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.5.1.9	**Spacetube and cradle**	**$123,449**	**0**	**0**

Notes

The spacetube will be nearly identical to the Run IIa spacetube. The spacetube spans the 2m length between mount points on the ISL and supports the weight of the barrels.
The mounts which attach to ISL need to be in precisely the same locations as in Run IIa.
The tube is actually a cylinder split lengthwise to allow barel installation from the top.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.5.1.9.1	**Spacetube prototype**	**$32,900**	**0**	**0**
1.1.5.1.9.1.1	Design spacetube	$9,582	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
10	DesignerSF	25%	78 hrs	0 days	Mon 12/2/02	Thu 1/30/03
11	MechEngSF	50%	156 hrs	0 days	Mon 12/2/02	Thu 1/30/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	25%	$2,975	$0	$0	$2,975
11	MechEngSF	50%	$6,607	$0	$0	$6,607

Notes

This is similar to the Run IIa space tube and will follow the Run IIa design.
The estimated labor includes the FEA analyses needed to complete the design.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.5.1.9.1.3	Fabricate prototype spacetube	$20,000	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
2	FNALR&D	0%	0 hrs	0 days	Wed 2/5/03	Wed 2/5/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	$20,000	$0	$0	$20,000

Notes

This is similar to the Run IIa spacetube.
Cost is estimated from Run IIa experience.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.5.1.9.2	**Spacetube Production**	**$90,549**	**0**	**0**
1.1.5.1.9.2.1	Project Pacing: start production space tube design	$0	0	0

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Project Pacing: start production space tube design " continued

1.1.5.1.9.2.2 Design production spactube $4,914 0 0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
10	DesignerSF	25%	40 hrs	0 days	Tue 11/18/03	Wed 12/17/03
11	MechEngSF	50%	80 hrs	0 days	Tue 11/18/03	Wed 12/17/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	25%	$1,526	$0	$0	$1,526
11	MechEngSF	50%	$3,388	$0	$0	$3,388

Notes

This covers the time needed to update drawings and adjust the design as a result of the prototype tests.

1.1.5.1.9.2.3 Fabricate production Spacetube $50,000 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	50,000	50,000	0 days	Thu 12/18/03	Wed 4/28/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	50,000	$50,000	$0	$0	$50,000

Notes

Cost is estimated form Run IIa experience

1.1.5.1.9.2.4 Test production spacetube $2,302 0 0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	10%	16 hrs	0 days	Thu 4/29/04	Wed 5/26/04
13	MechTechSF	10%	16 hrs	0 days	Thu 4/29/04	Wed 5/26/04
15	CMMProgrammerSF	25%	40 hrs	0 days	Thu 4/29/04	Wed 5/26/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	10%	$678	$0	$0	$678
13	MechTechSF	10%	$464	$0	$0	$464
15	CMMProgrammerSF	25%	$1,160	$0	$0	$1,160

Notes

Cost is labor. Structural characteristics will be measured and compared to FEA.

1.1.5.1.9.2.6 Design support cradle $7,965 0 0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
10	DesignerSF	75%	120 hrs	0 days	Thu 12/18/03	Wed 1/21/04
11	MechEngSF	50%	80 hrs	0 days	Thu 12/18/03	Wed 1/21/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	75%	$4,577	$0	$0	$4,577
11	MechEngSF	50%	$3,388	$0	$0	$3,388

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Design support cradle " continued

Notes

This cradle supports the space tube while the barrels and installed and aligned. It is mounted on
roller bearings which ride the rails on the CMM. This allows it to move around during installation of the beampipe and during installation into ISL.

1.1.5.1.10	**Layer 0**	**$198,193**	**0**	**0**

Notes

This is the Carbon Fiber Support for L0. It is mounted on outer bulkheads and has an integrated cooling system. This includes the structure which supports and cools the hybrids ouside the end of the barrel.

1.1.5.1.10.1	**Layer 0 CF support prototype**	**$105,492**	**0**	**0**

1.1.5.1.10.1.1	CF Support Prototype: design	$40,666	0	0.5

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*
10	*DesignerSF*	*50%*	*400 hrs*	*0 days*	*Mon 5/13/02*	*Wed 10/2/02*
11	*MechEngSF*	*75%*	*600 hrs*	*0 days*	*Mon 5/13/02*	*Wed 10/2/02*

ID	*Resource Name*	*Units*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
10	*DesignerSF*	*50%*	*$15,256*	*$0*	*$6,102*	*$9,154*
11	*MechEngSF*	*75%*	*$25,410*	*$0*	*$10,164*	*$15,246*

Notes

The assumption is that the L0 CF support structure design starts together with the design of the bulk head. This includes the support sturcture for the L0 hybrids which extend outside the outer barrel in z.

1.1.5.1.10.1.2	CF Support Prototype: manufacturing	$50,000	0.5	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*
2	*FNALR&D*	*0%*	*0 hrs*	*0 days*	*Wed 10/2/02*	*Wed 10/2/02*

ID	*Resource Name*	*Units*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
2	*FNALR&D*	*0%*	*$50,000*	*$0*	*$0*	*$50,000*

Notes

Fabrication of the first prototype of the CF support structure for L0.
The above fabrication is expected to take 5 months.
The cost is estimated from the Run IIa experience (M. Hrycyk)

1.1.5.1.10.1.3	CF Support Prototype: evaluation and testing	$14,826	0	0.5

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*
11	*MechEngSF*	*25%*	*120 hrs*	*0 days*	*Fri 8/15/03*	*Fri 11/7/03*
13	*MechTechSF*	*50%*	*240 hrs*	*0 days*	*Fri 8/15/03*	*Fri 11/7/03*
15	*CMMProgrammerSF*	*20%*	*96 hrs*	*0 days*	*Fri 8/15/03*	*Fri 11/7/03*
16	*PostDocU*	*50%*	*240 hrs*	*0 days*	*Fri 8/15/03*	*Fri 11/7/03*

WBS	Name	Cost	M&S Cont.	Labor Cont.

"CF Support Prototype: evaluation and testing" continued

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	25%	$5,082	$0	$0	$5,082
13	MechTechSF	50%	$6,960	$0	$0	$6,960
15	CMMProgrammerSF	20%	$2,784	$0	$0	$2,784
16	PostDocU	50%	$0	$0	$0	$0

Notes
Testing consists of both mechanical and electrical since now pre-production L0 modules are available.

1.1.5.1.10.1.4	Project Pacing: CF Support manufacturing evaluation and testing	$0	0	0
1.1.5.1.10.1.5	CF support Prototype ready and tested	$0	0	0
1.1.5.1.10.2	**Layer 0 CF support production**	**$92,701**	**0**	**0**
1.1.5.1.10.2.1	CF Support: Design	$9,337	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
10	DesignerSF	50%	116 hrs	0 days	Mon 9/15/03	Thu 10/23/03
11	MechEngSF	50%	116 hrs	0 days	Mon 9/15/03	Thu 10/23/03
16	PostDocU	25%	58 hrs	0 days	Mon 9/15/03	Thu 10/23/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	50%	$4,424	$0	$0	$4,424
11	MechEngSF	50%	$4,913	$0	$0	$4,913
16	PostDocU	25%	$0	$0	$0	$0

Notes
This is the final design for the L0 Cf support structure and the hybrid support structure

1.1.5.1.10.2.2	CF Support: manufacturing	$50,000	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	50,000	50,000	0 days	Wed 12/10/03	Tue 5/18/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	50,000	$50,000	$0	$0	$50,000

Notes
As for the prototype we assume 5 months for the production of the CF support structure.
The cost assumes we purchase the structure rather than build it in house.

1.1.5.1.10.2.3	Project pacing: CF Support manufacturing evaluation and testing	$0	0	0
1.1.5.1.10.2.4	CF Support: assembly and test	$33,364	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	75%	240 hrs	0 days	Thu 6/17/04	Thu 8/12/04
13	MechTechSF	200%	640 hrs	0 days	Thu 6/17/04	Thu 8/12/04

WBS	Name	Cost	M&S Cont.	Labor Cont.

"CF Support: assembly and test" continued

ID	Resource Name	Units	Work	Delay	Start	Finish
15	CMMProgrammerSF	50%	160 hrs	0 days	Thu 6/17/04	Thu 8/12/04
16	PostDocU	100%	320 hrs	0 days	Thu 6/17/04	Thu 8/12/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	75%	$10,164	$0	$0	$10,164
13	MechTechSF	200%	$18,560	$0	$0	$18,560
15	CMMProgrammerSF	50%	$4,640	$0	$0	$4,640
16	PostDocU	100%	$0	$0	$0	$0

Notes

Tests include alignment and cooling tests for hybrid structure and for silicon supports

1.1.5.1.10.2.5	L0 Supports Complete	$0	0	0
1.1.5.2	**Transportation Fixtures**	**$69,197**	**0**	**0**

Notes

This is the fixture for transporting ISL+SVXIIa or ISL+SVXIIb from/to the Assembly Hall.
It has to be finished before runiia ends. The fixtures for Run IIa will be reused as much as possible

1.1.5.2.1	transportation fixture: update design	$25,113	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
10	DesignerSF	100%	312 hrs	0 days	Tue 7/27/04	Mon 9/20/04
11	MechEngSF	100%	312 hrs	0 days	Tue 7/27/04	Mon 9/20/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	100%	$11,900	$0	$0	$11,900
11	MechEngSF	100%	$13,213	$0	$0	$13,213

Notes

This is the labor cost to update the design of the Run IIa transportation fixture

1.1.5.2.2	transportation fixture: fabrication	$20,000	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	20,000	20,000	0 days	Wed 9/22/04	Tue 11/16/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	20,000	$20,000	$0	$0	$20,000

Notes

This is the cost to update the Run IIa transportation fixtures.
The cost is estimated from the Run IIa transportation fixtures which cost 18k. We assume some of the parts can be reused.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.5.2.3	transportation fixture: final assembly and test	$24,084	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	50%	240 hrs	0 days	Wed 11/17/04	Thu 2/17/05
13	MechTechSF	100%	480 hrs	0 days	Wed 11/17/04	Thu 2/17/05

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	50%	$10,164	$0	$0	$10,164
13	MechTechSF	100%	$13,920	$0	$0	$13,920

Notes

This is the labor for assembly of the transportation fixure

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.5.3	**Positioning system (inchworms)**	**$41,502**	**0**	**0**

Notes

This system allows adjustment of the position of the entire silicon detector (ISL+SVXIIb+L0+ beampipe) relative the the outer tracker (COT) and the beamline.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.5.3.1	**Positioning System R&D**	**$20,506**	**0**	**0**
1.1.5.3.1.1	Project Pacing: Design replacement for inchworms	$0	0	0
1.1.5.3.1.2	positioning jacks(inchworms): design	$18,506	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
10	DesignerSF	100%	312 hrs	0 days	Thu 1/23/03	Tue 3/18/03
11	MechEngSF	50%	156 hrs	0 days	Thu 1/23/03	Tue 3/18/03
16	PostDocU	100%	312 hrs	0 days	Thu 1/23/03	Tue 3/18/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	100%	$11,900	$0	$0	$11,900
11	MechEngSF	50%	$6,607	$0	$0	$6,607
16	PostDocU	100%	$0	$0	$0	$0

Notes

This is the replacement for the remote positioning system (the inchworms) which attach to the outer flange of ISL and COT. These will be mechanical jacks that can only be adjusted when the plugs are open.
Labor:
design will be done in collaboration with U.Toronto.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.5.3.1.3	positioning jack prototype manufacturing	$2,000	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
2	FNALR&D	0%	0 hrs	0 days	Wed 3/19/03	Wed 3/19/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	$2,000	$0	$0	$2,000

Notes

This is the cost of manufacturing the prototype hardware.

WBS	Name	Cost	M&S Cont.	Labor Cont.

"positioning jack prototype manufacturing" continued

Notes

This may be covered by U. Toronto depending on a grant.
This is a much simpler design than for the Run IIa system.

1.1.5.3.1.4	Prototype positioning jack testing	$0	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
16	PostDocU	200%	640 hrs	0 days	Thu 5/15/03	Fri 7/11/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	PostDocU	200%	$0	$0	$0	$0

Notes

Labor:
This will be done by physicists at Toronto.
Estimated to be 2 FTE.

1.1.5.3.2	**Positioning System Production**	**$20,995**	**0**	**0**
1.1.5.3.2.1	positioning jacks: manufacturing	$15,000	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
18	MANDSPASS	15,000	15,000	0 days	Mon 7/14/03	Mon 9/8/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
18	MANDSPASS	15,000	$15,000	$0	$0	$15,000

Notes

Cost:
Toronto may cover some of the costs.
Esitamte 10k$ for jacks and 5k$ for new pieces to attach to COT.

1.1.5.3.2.2	positioning jacks: Assemble and test	$5,995	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	10%	32 hrs	0 days	Tue 9/9/03	Mon 11/3/03
13	MechTechSF	50%	160 hrs	0 days	Tue 9/9/03	Mon 11/3/03
16	PostDocU	200%	640 hrs	0 days	Tue 9/9/03	Mon 11/3/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	10%	$1,355	$0	$0	$1,355
13	MechTechSF	50%	$4,640	$0	$0	$4,640
16	PostDocU	200%	$0	$0	$0	$0

Notes

Labor:
This assembly and testing will mostly be done at Toronto.
Above labor estimted to be 2 FTE
Some eng, and tech. time will be needed for tests and FNAL

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.5.4	**Installation of SVXIIb into ISL**	**$80,868**	**0**	**0**

Notes

These are the fixtures that allows for both extracting SVXIIa from ISL and inserting SVXIIb into ISL.
Schedule:
This task needs to be done in time for the removal of SVXIIa from ISL

1.1.5.4.1 Design Fixtures for removal of SVXII and installation of SVXIIB $25,757 0 0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
10	DesignerSF	100%	320 hrs	0 days	Fri 5/28/04	Mon 7/26/04
11	MechEngSF	100%	320 hrs	0 days	Fri 5/28/04	Mon 7/26/04
16	PostDocU	50%	160 hrs	0 days	Fri 5/28/04	Mon 7/26/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	100%	$12,205	$0	$0	$12,205
11	MechEngSF	100%	$13,552	$0	$0	$13,552
16	PostDocU	50%	$0	$0	$0	$0

Notes

Schedule:
This task needs to be done in time for the removal of SVXIIa from ISL

1.1.5.4.2 Fabricate fixtures for SVX removal and installation of SVXIIb $30,000 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	30,000	30,000	0 days	Tue 7/27/04	Tue 10/19/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	30,000	$30,000	$0	$0	$30,000

Notes

Cost is based on an engineering estimate and IIa experience.
This is the cost to purchase the fixtures from outside.

1.1.5.4.3 emble and Test fixtures for SVX removal and installation of SVXIIb $9,831 0 0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	50%	76 hrs	0 days	Wed 10/20/04	Mon 11/15/04
13	MechTechSF	100%	152 hrs	0 days	Wed 10/20/04	Mon 11/15/04
15	CMMProgrammerSF	50%	76 hrs	0 days	Wed 10/20/04	Mon 11/15/04
16	PostDocU	50%	76 hrs	0 days	Wed 10/20/04	Mon 11/15/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	50%	$3,219	$0	$0	$3,219
13	MechTechSF	100%	$4,408	$0	$0	$4,408
15	CMMProgrammerSF	50%	$2,204	$0	$0	$2,204
16	PostDocU	50%	$0	$0	$0	$0

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Assemble and Test fixtures for SVX removal and installation of SVXIIb" continued

Notes

Labor:
This involves alignment and assembly of fixtures on the cmm at Sidet

1.1.5.4.4 Design and fabricate parts for ISL extension cylinder $15,280 0.5 0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
10	DesignerSF	10%	65.6 hrs	0 days	Wed 11/17/04	Mon 3/21/05
11	MechEngSF	10%	65.6 hrs	0 days	Wed 11/17/04	Mon 3/21/05
17	MANDS	10,000	10,000	0 days	Wed 11/17/04	Mon 3/21/05

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	10%	$2,502	$0	$0	$2,502
11	MechEngSF	10%	$2,778	$0	$0	$2,778
17	MANDS	10,000	$10,000	$0	$0	$10,000

Notes

This item covers the replacement and modification of the hardware that resides in the ISL extension cylinder. This consists of
1)Junction card support rings
2)beampipe deflection damper (dashpots)
3)support for cooling manifolds

1.1.6 Cooling and Monitoring $275,315 0 0

Notes

Thisi task covers the cooling system, the monitoring of the cooling and power to the detectors and the position monitors (RASNIKS)
50% cont. is included on all costed items

1.1.6.1 Cooling system Sidet $38,582 0 0

Notes

This task covers updating the cooling system at Sidet and B0 and the cost of new manifolds at the detector.

1.1.6.1.1 Build system for cooling staves during burnin $12,526 0.5 0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	5%	7.6 hrs	0 days	Wed 4/16/03	Mon 5/12/03
13	MechTechSF	50%	76 hrs	0 days	Wed 4/16/03	Mon 5/12/03
16	PostDocU	50%	76 hrs	0 days	Wed 4/16/03	Mon 5/12/03
17	MANDS	10,000	10,000	0 days	Wed 4/16/03	Tue 5/13/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	5%	$322	$0	$0	$322
13	MechTechSF	50%	$2,204	$0	$0	$2,204
16	PostDocU	50%	$0	$0	$0	$0
17	MANDS	10,000	$10,000	$0	$0	$10,000

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Build system for cooling staves during burnin" continued

Notes

This is the chiller system for the Stave burnin system.
Cost estimated from Run IIa experience.

1.1.6.1.2	Update Sidet barrel cooling system	$26,056	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	50%	160 hrs	0 days	Tue 10/21/03	Wed 12/17/03
13	MechTechSF	100%	320 hrs	0 days	Tue 10/21/03	Wed 12/17/03
16	PostDocU	50%	160 hrs	0 days	Tue 10/21/03	Wed 12/17/03
17	MANDS	10,000	10,000	0 days	Tue 10/21/03	Wed 12/17/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	50%	$6,776	$0	$0	$6,776
13	MechTechSF	100%	$9,280	$0	$0	$9,280
16	PostDocU	50%	$0	$0	$0	$0
17	MANDS	10,000	$10,000	$0	$0	$10,000

Notes

This is the cooling system that will be used during barrel construction testing of staves.
Interlocks will be part of full interlock system.
Labor:
some work is needed to upgrade the existing system.
Mostly a mech tech with some support.

1.1.6.2	**Cooling Manifolds and chiller components**	**$116,733**	**0**	**0**
1.1.6.2.1	Build internal manifolds and tubing	$41,037	0.5	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
10	DesignerSF	10%	80 hrs	0 days	Thu 3/20/03	Fri 8/8/03
11	MechEngSF	20%	96 hrs	0 days	Thu 3/20/03	Thu 6/12/03
13	MechTechSF	100%	480 hrs	0 days	Thu 3/20/03	Thu 6/12/03
17	MANDS	20,000	20,000	0 days	Thu 3/20/03	Fri 8/8/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	10%	$3,051	$0	$0	$3,051
11	MechEngSF	20%	$4,066	$0	$0	$4,066
13	MechTechSF	100%	$13,920	$0	$0	$13,920
17	MANDS	20,000	$20,000	$0	$0	$20,000

Notes

These are the manifolds/connections at the ends of the staves and the L0 cooling connections.
Cost: based on IIa experience, and includes plumbing support hardware.
PEEK tubing, Tube bending fixture,
Machined PEEK, Tubing and L0 parts
Labor:

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Build internal manifolds and tubing" continued

Notes

Needed for testing and assembling of parts.
Moslty a mech. tech. + support.

1.1.6.2.2	project pacing: build external manifolds, chiller parts	$0	0	0
1.1.6.2.3	Build external manifolds	$17,598	0.5	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
10	DesignerSF	20%	94.4 hrs	0 days	Mon 8/2/04	Fri 10/22/04
11	MechEngSF	20%	94.4 hrs	0 days	Mon 8/2/04	Fri 10/22/04
17	MANDS	10,000	10,000	0 days	Mon 8/2/04	Mon 10/25/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	20%	$3,600	$0	$0	$3,600
11	MechEngSF	20%	$3,998	$0	$0	$3,998
17	MANDS	10,000	$10,000	$0	$0	$10,000

Notes

These are the manifolds at the end of the cot.

1.1.6.2.4	production chiller components, manifolds, control valves	$58,098	0.5	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	50%	280 hrs	0 days	Tue 10/26/04	Wed 2/9/05
13	MechTechSF	100%	560 hrs	0 days	Tue 10/26/04	Wed 2/9/05
17	MANDS	30,000	30,000	0 days	Tue 10/26/04	Fri 2/11/05

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	50%	$11,858	$0	$0	$11,858
13	MechTechSF	100%	$16,240	$0	$0	$16,240
17	MANDS	30,000	$30,000	$0	$0	$30,000

Notes

Cost:
These are the costs associated with updating the chillers at B0. The cost is based on an email from Rich Stanek (Lead cooling engineer on Run IIa project) in Sept. 01.
Labor:
Mostly a mech. tech + support.

1.1.6.3	**Interlocks**	**$100,000**	**0**	**0**

Notes

This is the system that montors the power and temperature of the detectors.
It will resue most of the existing system.

1.1.6.3.1	Upgrade existing system	$100,000	1	1

ID	Resource Name	Units	Work	Delay	Start	Finish
16	PostDocU	50%	800 hrs	0 days	Wed 1/14/04	Mon 10/25/04

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Upgrade existing system" continued

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	100,000	100,000	0 days	Wed 1/14/04	Mon 10/25/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	PostDocU	50%	$0	$0	$0	$0
17	MANDS	100,000	$100,000	$0	$0	$100,000

Notes

Cost:
Physicist estimate.
This is the cost to upgrade the interlock system for Run IIb. Additional temperature and current channels will be needed.

1.1.6.4	Position Monitoring	$20,000	0	0

Notes

This is to update the esisting position monitoring system (RASNIK).
Cost is based on Run IIa experience and resuing the DAQ already setup.
Labor:
there is no FNAL labor for this task, Toronto is taking on this project

1.1.6.4.1	prototype Rasniks	$0	0	0
1.1.6.4.1.1	Rasnik Prototype manufacturing and test	$0	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
16	PostDocU	150%	1,200 hrs	0 days	Thu 10/17/02	Fri 3/14/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	PostDocU	150%	$0	$0	$0	$0

Notes

This covers the cost to make and test a Rasnik module.
Cost:
Toronto will cover this cost.
Labor:
assembling and test done at U.Toronto.
Estimated to be 1.5 FTE

1.1.6.4.2	production rasnik	$20,000	0	0
1.1.6.4.2.1	Rasnik Production	$20,000	0.5	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
16	PostDocU	200%	640 hrs	0 days	Thu 3/20/03	Wed 5/14/03
18	MANDSPASS	20,000	20,000	0 days	Thu 3/20/03	Wed 5/14/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
16	PostDocU	200%	$0	$0	$0	$0
18	MANDSPASS	20,000	$20,000	$0	$0	$20,000

WBS	Name	Cost	M&S Cont.	Labor Cont.
"Rasnik Production" continued				

Notes

Cost:
Cost is based on cost to fabricate additional modules with assembling.
Cost/module comes from UCLA experience on IIa.
Labor:
testing of modules will be done at U.Toronto
estimated 2 FTE

1.1.6.4.2.2	Rasniks Complete	$0	0	0
1.1.7	**Final Assembly (Installation and Integration)**	**$577,126**	**0**	**0**

Notes

This task covers installation of staves into the barrels, installation of L0 modules on the CF supports and the integration of L0 and beampipe with the outer barrel

1.1.7.1	**Stave Installation (Outer)**	**$281,693**	**0**	**0**

Notes

This covers installation of all layers except for L0.

The stave installation fixture will be similar to the fixture used in Run IIa, but it will be larger.
This fixture holds the bulkheads and staves while the staves are installed. It has a precision angular encoder. The staves are supported on long arms which are attached to roller bearings. Precise adjustment cabability is incorporated into the arms.
In Run IIa the prototype + production fixture cost 50k$ (two sets). Here we estimate 30k$ for the prototype and 70k$ for the two production fixtures.
We need two complete production fixtures so that two barrels can be assembed in parallel.

1.1.7.1.1	**Stave Installation Fixture Prototype**	**$74,523**	**0**	**0**
1.1.7.1.1.1	Prototype stave installation fixture: Design	$32,533	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
10	DesignerSF	50%	320 hrs	0 days	Thu 10/3/02	Fri 1/31/03
11	MechEngSF	75%	480 hrs	0 days	Thu 10/3/02	Fri 1/31/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	50%	$12,205	$0	$0	$12,205
11	MechEngSF	75%	$20,328	$0	$0	$20,328

1.1.7.1.1.2	Prototype stave installation fixture: fabrication	$30,000	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
2	FNALR&D	0%	0 hrs	0 days	Wed 2/5/03	Wed 2/5/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	$30,000	$0	$0	$30,000

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Prototype stave installation fixture: fabrication" continued

Notes

The stave installation fixture will be similar to the fixture used in Run IIa, but it will be larger.
This fixture holds the bulkheads and staves while the staves are installed. It has a precision angular encoder. The staves are supported on long arms which are attached to roller bearings. Precise adjustment cabability is incorporated into the arms.
In Run IIa the prototype + production fixture cost 50k$ (two sets). Here we estimate 30k$ for the prototype and 70k$ for the two production fixtures.
We need two complete production fixtures so that two barrels can be assembed in parallel.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.7.1.1.3	Prototype stave installation fixture: setup and test	$11,990	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	20%	64 hrs	0 days	Thu 5/1/03	Thu 6/26/03
13	MechTechSF	50%	160 hrs	0 days	Thu 5/1/03	Thu 6/26/03
15	CMMProgrammerSF	50%	160 hrs	0 days	Thu 5/1/03	Thu 6/26/03
16	PostDocU	50%	160 hrs	0 days	Thu 5/1/03	Thu 6/26/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	20%	$2,710	$0	$0	$2,710
13	MechTechSF	50%	$4,640	$0	$0	$4,640
15	CMMProgrammerSF	50%	$4,640	$0	$0	$4,640
16	PostDocU	50%	$0	$0	$0	$0

1.1.7.1.1.4	Project Pacing: tests of Stave installation and associated parts	$0	0	0
1.1.7.1.1.5	Milestone: all tests of stave installation, screen mounting, complete	$0	0	0
1.1.7.1.2	**Stave Installation Fixture Production**	**$144,232**	**0**	**0**
1.1.7.1.2.2	Stave installation fixtures: design	$18,981	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
10	DesignerSF	50%	320 hrs	0 days	Fri 6/27/03	Mon 10/20/03
11	MechEngSF	25%	160 hrs	0 days	Fri 6/27/03	Mon 10/20/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	50%	$12,205	$0	$0	$12,205
11	MechEngSF	25%	$6,776	$0	$0	$6,776

Notes

Final Stave installation fixture design will start as soon as the final bulk-head design is finished and the R&D is completed.

1.1.7.1.2.3	Stave installation fixtures: fabrication	$70,000	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	70,000	70,000	0 days	Tue 10/21/03	Wed 2/4/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	70,000	$70,000	$0	$0	$70,000

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Stave installation fixtures: fabrication" continued

Notes

The stave installation fixture will be similar to the fixture used in Run IIa, but it will be larger.
This fixture holds the bulkheads and staves while the staves are installed. It has a precision angular encoder. The staves are supported on long arms which are attached to roller bearings. Precise adjustment cabability is incorporated into the arms.
In Run IIa the prototype + production fixture cost 50k$ (two sets). Here we estimate 30k$ for the prototype and 70k$ for the two production fixtures.
We need two complete production fixtures so that two barrels can be assembed in parallel.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.7.1.2.4	Stave installation fixture: setup and Alignment	$45,148	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	25%	80 hrs	0 days	Thu 2/5/04	Wed 3/31/04
13	MechTechSF	400%	1,280 hrs	0 days	Thu 2/5/04	Wed 3/31/04
15	CMMProgrammerSF	50%	160 hrs	0 days	Thu 2/5/04	Wed 3/31/04
16	PostDocU	100%	320 hrs	0 days	Thu 2/5/04	Wed 3/31/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	25%	$3,388	$0	$0	$3,388
13	MechTechSF	400%	$37,120	$0	$0	$37,120
15	CMMProgrammerSF	50%	$4,640	$0	$0	$4,640
16	PostDocU	100%	$0	$0	$0	$0

Notes

This will be setup on a CMM and mechanical staves will be used to test the installation procedures.
Two technicians will be needed to set up each fixture. There are two fixtures.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.7.1.2.5	Bulkhead installation and alignment	$10,103	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	20%	30.4 hrs	0 days	Thu 4/1/04	Tue 4/27/04
13	MechTechSF	100%	152 hrs	0 days	Thu 4/1/04	Tue 4/27/04
15	CMMProgrammerSF	100%	152 hrs	0 days	Thu 4/1/04	Tue 4/27/04
16	PostDocU	25%	38 hrs	0 days	Thu 4/1/04	Tue 4/27/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	20%	$1,287	$0	$0	$1,287
13	MechTechSF	100%	$4,408	$0	$0	$4,408
15	CMMProgrammerSF	100%	$4,408	$0	$0	$4,408
16	PostDocU	25%	$0	$0	$0	$0

Notes

Bulkheads must be precisely aligned to each other and to the CMM reference system.
Material Costs are covered in inner and outer screen installation item.
This task includes the time to glue the bulkheads together onto the inner screen.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.7.1.2.6	Ready for stave installation	$0	0	0

WBS	Name	Cost	M&S Cont.	Labor Cont.
"Ready for stave installation" continued				
1.1.7.1.3	**Stave Installation**	**$62,937**	**0**	**0**
1.1.7.1.3.1	Project pacing: stave installation start	$0	0	0
1.1.7.1.3.2	Stave installation begins	$0	0	0
1.1.7.1.3.3	Installation of staves	$28,619	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	10%	79.2 hrs	0 days	Fri 7/23/04	Mon 12/13/04
13	MechTechSF	100%	792 hrs	0 days	Fri 7/23/04	Mon 12/13/04
15	CMMProgrammerSF	10%	79.2 hrs	0 days	Fri 7/23/04	Mon 12/13/04
16	PostDocU	75%	594 hrs	0 days	Fri 7/23/04	Mon 12/13/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	10%	$3,354	$0	$0	$3,354
13	MechTechSF	100%	$22,968	$0	$0	$22,968
15	CMMProgrammerSF	10%	$2,297	$0	$0	$2,297
16	PostDocU	75%	$0	$0	$0	$0

Notes

Labor:
estimated based on runII experience.
Installing and aligning/measuring staves should be a rather fast task. We foresee that it will be done in batches (i.e. wait for a certain number of staves to be ready for installation and the install them).
We estimate that we can install 2 staves/day (for Run IIA we installed as many as 6/day) for a total of 90 days.
As in the Run IIa project, stave installation will gradually catch up with stave production so that
stave installation finishes as the last stave is produced.

1.1.7.1.3.4	Installation of Stave: electrical testing	$0	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
7	PhysicistF	25%	198 hrs	0 days	Fri 7/30/04	Mon 12/20/04
16	PostDocU	250%	1,980 hrs	0 days	Fri 7/30/04	Mon 12/20/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PhysicistF	25%	$0	$0	$0	$0
16	PostDocU	250%	$0	$0	$0	$0

Notes

Labor:
This is the electrical testing of staves after installation into the barrels.
The staves were extensively tested and burned in during the stave production testing task.
The testing here is a quick test to prove that the staves were not damaged
during the installation. We estimate 1 hour/stave based on Run IIa experience.
Labor is all postdoc and physicists.
This is a task that spans the stave installation but is only done oncea week, or after a significant number of staves have been installed.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.7.1.3.5	Stave installation complete	$0	0	0
1.1.7.1.3.6	Final system tests	$16,819	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
7	PhysicistF	100%	152 hrs	0 days	Wed 12/8/04	Fri 1/7/05
8	ElecEngF	50%	76 hrs	0 days	Wed 12/8/04	Fri 1/7/05
9	ElecTechF	25%	38 hrs	0 days	Wed 12/8/04	Fri 1/7/05
11	MechEngSF	50%	76 hrs	0 days	Wed 12/8/04	Fri 1/7/05
13	MechTechSF	200%	304 hrs	0 days	Wed 12/8/04	Fri 1/7/05
16	PostDocU	400%	608 hrs	0 days	Wed 12/8/04	Fri 1/7/05

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PhysicistF	100%	$0	$0	$0	$0
8	ElecEngF	50%	$3,872	$0	$0	$3,872
9	ElecTechF	25%	$912	$0	$0	$912
11	MechEngSF	50%	$3,219	$0	$0	$3,219
13	MechTechSF	200%	$8,816	$0	$0	$8,816
16	PostDocU	400%	$0	$0	$0	$0

Notes

This is the final system test. Goal should be to establish that all staves are working, cooling is working and everything is aligned to specs.
The assumption is that it takes 10 days per barrel.
The 1st barrel is fully tested while the second barrel is being finished.
Thus this task is 20 days, and finished 10 days after stave installation is
completed.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.7.1.3.7	installation of outer screen	$2,569	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	50%	36 hrs	0 days	Fri 1/7/05	Thu 1/20/05
13	MechTechSF	50%	36 hrs	0 days	Fri 1/7/05	Thu 1/20/05

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	50%	$1,525	$0	$0	$1,525
13	MechTechSF	50%	$1,044	$0	$0	$1,044

Notes

Schedule:
We estimate that is will take 5 days to glue the outer screen on to each barrel.
The outer screen will be in 3 parts and we allow 2 days for setup and 1 day for gluing each part.
We assume the 1st barrel is done in parallel with finishing the 2nd barrel, thus this task ends
5 days after testing is completed.
Material costs are covered by inner and outer screen installation fixtures in earlier item.
We assume that we will be able to continue our final system tests even after the outer screen is installed

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.7.1.3.8	remove axle	$3,613	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	50%	36 hrs	0 days	Fri 1/14/05	Thu 1/27/05
13	MechTechSF	50%	36 hrs	0 days	Fri 1/14/05	Thu 1/27/05
15	CMMProgrammerSF	50%	36 hrs	0 days	Fri 1/14/05	Thu 1/27/05

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	50%	$1,525	$0	$0	$1,525
13	MechTechSF	50%	$1,044	$0	$0	$1,044
15	CMMProgrammerSF	50%	$1,044	$0	$0	$1,044

Notes

We assume it takes 5 days per barrel to remove the axle
extract the barrel from the stave installation fixturing.
The 1st barrel is done while the stave installation is continuing on
the 2nd barrel.

1.1.7.1.3.9	Installation of barrel in spacetube	$6,181	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	100%	72 hrs	0 days	Fri 1/21/05	Wed 2/2/05
13	MechTechSF	100%	72 hrs	0 days	Fri 1/21/05	Wed 2/2/05
15	CMMProgrammerSF	50%	36 hrs	0 days	Fri 1/21/05	Wed 2/2/05
16	PostDocU	50%	36 hrs	0 days	Fri 1/21/05	Wed 2/2/05

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	100%	$3,049	$0	$0	$3,049
13	MechTechSF	100%	$2,088	$0	$0	$2,088
15	CMMProgrammerSF	50%	$1,044	$0	$0	$1,044
16	PostDocU	50%	$0	$0	$0	$0

Notes

Schedule:
Based on the time required for the iia silicon system
The barrels are placed in the space tube and then aligned.
We assume it takes 5 days for each barrel and the 1st barrel is done
in parallel with finishing the stave installation in the 2nd barrel.
Material Cost based on estimate from G. Derylo and Y. Orlov April 18, 2002
Transport to spacetube - 5k$
Total = 5k

1.1.7.1.3.10	dressing of cables and cooling	$5,137	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	100%	72 hrs	0 days	Fri 1/28/05	Wed 2/9/05
13	MechTechSF	100%	72 hrs	0 days	Fri 1/28/05	Wed 2/9/05
16	PostDocU	200%	144 hrs	0 days	Fri 1/28/05	Wed 2/9/05

WBS	Name	Cost	M&S Cont.	Labor Cont.

"dressing of cables and cooling" continued

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	100%	$3,049	$0	$0	$3,049
13	MechTechSF	100%	$2,088	$0	$0	$2,088
16	PostDocU	200%	$0	$0	$0	$0

Notes

Schedule:
Based on the time required for the iia silicon system
We estimate it will take 5 days per barrel and that the 1st barrel is finished before the 2nd one is installed.

1.1.7.1.3.11	Contingency on Completion of outer detector (20)	$0	0	0
1.1.7.1.3.12	Outer Detector Complete	$0	0	0
1.1.7.2	**L0 Module Installation (Inner)**	**$131,254**	**0**	**0**

Notes

These are the fixtures for installaing the L0 modules onto the CF structure.

1.1.7.2.1	**L0 installation fixture prototype**	**$48,533**	**0**	**0**
1.1.7.2.1.1	L0 module installation fixtures: design	$12,878	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
10	DesignerSF	50%	160 hrs	0 days	Thu 10/3/02	Fri 11/29/02
11	MechEngSF	50%	160 hrs	0 days	Thu 10/3/02	Fri 11/29/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	50%	$6,102	$0	$0	$6,102
11	MechEngSF	50%	$6,776	$0	$0	$6,776

Notes

This is the desin of the fixture for installing and aligning modules on the L0 Cf support structure
This is the time estimated from Run IIa experience

1.1.7.2.1.2	L0 module installation fixtures: fabrication	$20,000	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
2	FNALR&D	0%	0 hrs	0 days	Fri 11/29/02	Fri 11/29/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	$20,000	$0	$0	$20,000

Notes

Cost:
1 fixture at 20k based on experience with Run iia l00 design

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.7.2.1.3	L0 module installation fixtures: assembly and test	$15,655	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	50%	156 hrs	0 days	Thu 2/6/03	Tue 4/1/03
13	MechTechSF	50%	156 hrs	0 days	Thu 2/6/03	Tue 4/1/03
15	CMMProgrammerSF	50%	156 hrs	0 days	Thu 2/6/03	Tue 4/1/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	50%	$6,607	$0	$0	$6,607
13	MechTechSF	50%	$4,524	$0	$0	$4,524
15	CMMProgrammerSF	50%	$4,524	$0	$0	$4,524

Notes

This task involves testing installation and alignment procedures. It is based on Run IIa experience with L00.

1.1.7.2.2	**L0 installation fixture Production**	**$65,230**	**0**	**0**

1.1.7.2.2.1	L0 module installation fixtures: design	$12,878	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
10	DesignerSF	50%	160 hrs	0 days	Wed 12/10/03	Tue 2/10/04
11	MechEngSF	50%	160 hrs	0 days	Wed 12/10/03	Tue 2/10/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	50%	$6,102	$0	$0	$6,102
11	MechEngSF	50%	$6,776	$0	$0	$6,776

Notes

This is the time estimated from Run IIa experience

1.1.7.2.2.2	L0 module installation fixtures: fabrication	$40,000	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	40,000	40,000	0 days	Wed 2/18/04	Tue 4/13/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	40,000	$40,000	$0	$0	$40,000

Notes

Cost:
2 fixtures at 20k each based on experience with Run iia l00 design

1.1.7.2.2.3	L0 module installation fixtures: assembly and setup	$12,351	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	25%	78 hrs	0 days	Wed 4/14/04	Tue 6/8/04
13	MechTechSF	50%	156 hrs	0 days	Wed 4/14/04	Tue 6/8/04
15	CMMProgrammerSF	50%	156 hrs	0 days	Wed 4/14/04	Tue 6/8/04

WBS	Name	Cost	M&S Cont.	Labor Cont.

"L0 module installation fixtures: assembly and setup" continued

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	25%	$3,303	$0	$0	$3,303
13	MechTechSF	50%	$4,524	$0	$0	$4,524
15	CMMProgrammerSF	50%	$4,524	$0	$0	$4,524

Notes

This task involves testing installation and alignment procedures. It is based on Run IIa experience with L00.

1.1.7.2.3	**L0 installation**	**$17,492**	**0**	**0**
1.1.7.2.3.1	Installation of L0 Modules	$10,118	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	10%	28 hrs	0 days	Fri 8/13/04	Fri 10/1/04
13	MechTechSF	100%	280 hrs	0 days	Fri 8/13/04	Fri 10/1/04
15	CMMProgrammerSF	10%	28 hrs	0 days	Fri 8/13/04	Fri 10/1/04
16	PostDocU	50%	140 hrs	0 days	Fri 8/13/04	Fri 10/1/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	10%	$1,186	$0	$0	$1,186
13	MechTechSF	100%	$8,120	$0	$0	$8,120
15	CMMProgrammerSF	10%	$812	$0	$0	$812
16	PostDocU	50%	$0	$0	$0	$0

Notes

we expect to do at least 3 modules/day: 144 modules = 24 days
based on Run iia experience with L00
In this case the time also includes dressing the HDIs to the HDI support structure
~10 days based on Run IIa experience

1.1.7.2.3.2	L0 System Tests	$6,310	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
7	PhysicistF	100%	312 hrs	0 days	Mon 10/4/04	Mon 11/29/04
8	ElecEngF	20%	62.4 hrs	0 days	Mon 10/4/04	Mon 11/29/04
11	MechEngSF	10%	31.2 hrs	0 days	Mon 10/4/04	Mon 11/29/04
13	MechTechSF	20%	62.4 hrs	0 days	Mon 10/4/04	Mon 11/29/04
16	PostDocU	200%	624 hrs	0 days	Mon 10/4/04	Mon 11/29/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PhysicistF	100%	$0	$0	$0	$0
8	ElecEngF	20%	$3,179	$0	$0	$3,179
11	MechEngSF	10%	$1,321	$0	$0	$1,321
13	MechTechSF	20%	$1,810	$0	$0	$1,810
16	PostDocU	200%	$0	$0	$0	$0

WBS	Name	Cost	M&S Cont.	Labor Cont.
"L0 System Tests" continued				

Notes
These tests will determine final grounding and shielding.
We assume one month of testing for each half of L0.

1.1.7.2.3.3	Project Pacing: L0 System Tests	$0	0	0

Notes
Contingency on the L0 system test.

1.1.7.2.3.4	Installation of Screens	$1,064	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	10%	3.2 hrs	0 days	Fri 1/7/05	Wed 1/12/05
13	MechTechSF	100%	32 hrs	0 days	Fri 1/7/05	Wed 1/12/05
16	PostDocU	100%	32 hrs	0 days	Fri 1/7/05	Wed 1/12/05

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	10%	$136	$0	$0	$136
13	MechTechSF	100%	$928	$0	$0	$928
16	PostDocU	100%	$0	$0	$0	$0

Notes
This represents an additional electrical shield around L0.

1.1.7.2.3.5	Inner Detector Complete	$0	0	0
1.1.7.3	**Integration**	**$164,179**	**0**	**0**

Notes
This task incudes the fixtures and labor associated with installing the inner detector (L0) into the outer barrel. All costs and labor are estimated based on Run IIa experience

1.1.7.3.1	**Integration Fixture Prototype**	**$50,609**	**0**	**0**
1.1.7.3.1.1	Prototype Inner Detector Installation Fixtures: design	$25,435	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
10	DesignerSF	50%	316 hrs	0 days	Mon 9/15/03	Fri 1/9/04
11	MechEngSF	50%	316 hrs	0 days	Mon 9/15/03	Fri 1/9/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	50%	$12,052	$0	$0	$12,052
11	MechEngSF	50%	$13,383	$0	$0	$13,383

Notes
These are the fixtures for installing the inner detectors into the outer svxiib barrel.
Start date is driven by evaluation of prototype CF L0 support structure plus a 20day lag time.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.7.3.1.2	Prototype Inner Detector Installation Fixtures: fabrication	$20,000	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
2	FNALR&D	0%	0 hrs	0 days	Tue 1/20/04	Tue 1/20/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	$20,000	$0	$0	$20,000

Notes

Cost:
Price is based on L00 installation fixtures

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.7.3.1.3	Prototype Inner Detector Installation Fixtures: test	$5,174	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	25%	40 hrs	0 days	Wed 4/14/04	Tue 5/11/04
13	MechTechSF	50%	80 hrs	0 days	Wed 4/14/04	Tue 5/11/04
15	CMMProgrammerSF	25%	40 hrs	0 days	Wed 4/14/04	Tue 5/11/04
16	PostDocU	50%	80 hrs	0 days	Wed 4/14/04	Tue 5/11/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	25%	$1,694	$0	$0	$1,694
13	MechTechSF	50%	$2,320	$0	$0	$2,320
15	CMMProgrammerSF	25%	$1,160	$0	$0	$1,160
16	PostDocU	50%	$0	$0	$0	$0

Notes

This test is setup on a CMM and the alignment is tested

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.7.3.2	**Integration Fixture Production**	**$39,662**	**0**	**0**
1.1.7.3.2.1	Inner Detector Installation Fixtures: Final Design	$14,488	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
10	DesignerSF	50%	180 hrs	0 days	Wed 5/12/04	Thu 7/15/04
11	MechEngSF	50%	180 hrs	0 days	Wed 5/12/04	Thu 7/15/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	50%	$6,865	$0	$0	$6,865
11	MechEngSF	50%	$7,623	$0	$0	$7,623

Notes

This covers the redesign/ adjustments to the prototype fixtures

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.7.3.2.2	Inner Detector Installation Fixtures: fabrication	$20,000	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	20,000	20,000	0 days	Fri 7/16/04	Fri 10/8/04

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Inner Detector Installation Fixtures: fabrication" continued

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	20,000	$20,000	$0	$0	$20,000

Notes

Cost:
Price is based on L00 installation fixtures

1.1.7.3.2.3	Inner Detector Installation Fixtures: test	$5,174	0	0.5	

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	25%	40 hrs	0 days	Mon 10/11/04	Fri 11/5/04
13	MechTechSF	50%	80 hrs	0 days	Mon 10/11/04	Fri 11/5/04
15	CMMProgrammerSF	25%	40 hrs	0 days	Mon 10/11/04	Fri 11/5/04
16	PostDocU	50%	80 hrs	0 days	Mon 10/11/04	Fri 11/5/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	25%	$1,694	$0	$0	$1,694
13	MechTechSF	50%	$2,320	$0	$0	$2,320
15	CMMProgrammerSF	25%	$1,160	$0	$0	$1,160
16	PostDocU	50%	$0	$0	$0	$0

Notes

Setup on CMM and test alignment

1.1.7.3.2.4	Ready to integrate inner and outer detectors	$0	0	0
1.1.7.3	**Beampipe Installation Fixtures**	**$17,825**	**0**	**0**
1.1.7.3.3.1	Beampipe installation fixture: Design	$6,117	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
10	DesignerSF	50%	76 hrs	0 days	Fri 6/25/04	Thu 7/22/04
11	MechEngSF	50%	76 hrs	0 days	Fri 6/25/04	Thu 7/22/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	50%	$2,899	$0	$0	$2,899
11	MechEngSF	50%	$3,219	$0	$0	$3,219

Notes

This is based on Run IIa experience.
Start date is set by evaluation of production space tube plus a lag of 20 days.

1.1.7.3.3.2	Beampipe installation fixture: fabrication	$5,000	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	5,000	5,000	0 days	Mon 7/26/04	Fri 8/20/04

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Beampipe installation fixture: fabrication" continued

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	5,000	$5,000	$0	$0	$5,000

1.1.7.3.3.3 procure mockup beampipe $1,000 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	1,000	1,000	0 days	Mon 8/23/04	Mon 9/20/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	1,000	$1,000	$0	$0	$1,000

Notes

Cost:
This is an estimate to construct a Stainless Steel mockup beampipe for testing intallation and supports

1.1.7.3.3.4 Beampipe installation fixture: test $5,708 0 0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	50%	80 hrs	0 days	Tue 9/21/04	Mon 10/18/04
13	MechTechSF	50%	80 hrs	0 days	Tue 9/21/04	Mon 10/18/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	50%	$3,388	$0	$0	$3,388
13	MechTechSF	50%	$2,320	$0	$0	$2,320

1.1.7.3.4 Update cradle support rail system $23,315 0 0

Notes

THis is to update the current rail support system for positioning the barrel spacetube.

1.1.7.3.4.1 rail system: Design $7,515 0 0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
10	DesignerSF	50%	156 hrs	0 days	Thu 2/6/03	Tue 4/1/03
11	MechEngSF	5%	15.6 hrs	0 days	Thu 2/6/03	Tue 4/1/03
13	MechTechSF	10%	31.2 hrs	0 days	Thu 2/6/03	Tue 4/1/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	DesignerSF	50%	$5,950	$0	$0	$5,950
11	MechEngSF	5%	$661	$0	$0	$661
13	MechTechSF	10%	$905	$0	$0	$905

Notes

Update the current rail system and fabricate a duplicate for the new CMM.

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.7.3.4.2	rail system: Fabrication	$10,000	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish
17	MANDS	10,000	10,000	0 days	Thu 4/3/03	Wed 4/30/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	MANDS	10,000	$10,000	$0	$0	$10,000

Notes

Fabricate duplicate rail system and parts for upgrading the existing one.

1.1.7.3.4.3	rail system: assembly and alignment	$5,800	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
13	MechTechSF	100%	160 hrs	0 days	Thu 5/1/03	Thu 5/29/03
15	CMMProgrammerSF	25%	40 hrs	0 days	Thu 5/1/03	Thu 5/29/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
13	MechTechSF	100%	$4,640	$0	$0	$4,640
15	CMMProgrammerSF	25%	$1,160	$0	$0	$1,160

1.1.7.3.5	**Detector Integration**	**$32,767**	**0**	**0**
1.1.7.3.5.1	Combine Inner and Outer Detectors	$7,225	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
7	PhysicistF	100%	72 hrs	0 days	Fri 2/11/05	Wed 2/23/05
11	MechEngSF	100%	72 hrs	0 days	Fri 2/11/05	Wed 2/23/05
13	MechTechSF	100%	72 hrs	0 days	Fri 2/11/05	Wed 2/23/05
15	CMMProgrammerSF	100%	72 hrs	0 days	Fri 2/11/05	Wed 2/23/05
16	PostDocU	100%	72 hrs	0 days	Fri 2/11/05	Wed 2/23/05

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PhysicistF	100%	$0	$0	$0	$0
11	MechEngSF	100%	$3,049	$0	$0	$3,049
13	MechTechSF	100%	$2,088	$0	$0	$2,088
15	CMMProgrammerSF	100%	$2,088	$0	$0	$2,088
16	PostDocU	100%	$0	$0	$0	$0

Notes

This assumes the fixtures were already setup and aligned.
This includes the connections for L0 cooling and dressing.

1.1.7.3.5.2	Install Beampipe and supports	$8,028	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
7	PhysicistF	100%	80 hrs	0 days	Fri 2/25/05	Thu 3/10/05
11	MechEngSF	100%	80 hrs	0 days	Fri 2/25/05	Thu 3/10/05
13	MechTechSF	100%	80 hrs	0 days	Fri 2/25/05	Thu 3/10/05

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Install Beampipe and supports" continued

ID	Resource Name	Units	Work	Delay	Start	Finish
15	CMMProgrammerSF	100%	80 hrs	0 days	Fri 2/25/05	Thu 3/10/05
16	PostDocU	100%	80 hrs	0 days	Fri 2/25/05	Thu 3/10/05

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PhysicistF	100%	$0	$0	$0	$0
11	MechEngSF	100%	$3,388	$0	$0	$3,388
13	MechTechSF	100%	$2,320	$0	$0	$2,320
15	CMMProgrammerSF	100%	$2,320	$0	$0	$2,320
16	PostDocU	100%	$0	$0	$0	$0

Notes

This assumes the fixtures were already setup and aligned

1.1.7.3.5.3 Final survey $8,028 0 0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	100%	80 hrs	0 days	Fri 3/11/05	Thu 3/24/05
13	MechTechSF	100%	80 hrs	0 days	Fri 3/11/05	Thu 3/24/05
15	CMMProgrammerSF	100%	80 hrs	0 days	Fri 3/11/05	Thu 3/24/05
16	PostDocU	100%	80 hrs	0 days	Fri 3/11/05	Thu 3/24/05

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	100%	$3,388	$0	$0	$3,388
13	MechTechSF	100%	$2,320	$0	$0	$2,320
15	CMMProgrammerSF	100%	$2,320	$0	$0	$2,320
16	PostDocU	100%	$0	$0	$0	$0

Notes

relative alignment of the barrels is determined algon with alignment to external reference system

1.1.7.3.5.4 Final Cooling and electrical Tests $6,052 0 0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
7	PhysicistF	100%	80 hrs	0 days	Fri 3/25/05	Thu 4/7/05
8	ElecEngF	50%	40 hrs	0 days	Fri 3/25/05	Thu 4/7/05
11	MechEngSF	50%	40 hrs	0 days	Fri 3/25/05	Thu 4/7/05
13	MechTechSF	100%	80 hrs	0 days	Fri 3/25/05	Thu 4/7/05
16	PostDocU	400%	320 hrs	0 days	Fri 3/25/05	Thu 4/7/05

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PhysicistF	100%	$0	$0	$0	$0
8	ElecEngF	50%	$2,038	$0	$0	$2,038
11	MechEngSF	50%	$1,694	$0	$0	$1,694
13	MechTechSF	100%	$2,320	$0	$0	$2,320
16	PostDocU	400%	$0	$0	$0	$0

WBS	Name	Cost	M&S Cont.	Labor Cont.

"Final Cooling and electrical Tests" continued

Notes
Large fraction of system will be run

1.1.7.3.5.5	Close top of spacetube(final dressing, position monitors)	$3,434	0	0.5

ID	Resource Name	Units	Work	Delay	Start	Finish
11	MechEngSF	100%	40 hrs	0 days	Fri 4/8/05	Thu 4/14/05
13	MechTechSF	100%	40 hrs	0 days	Fri 4/8/05	Thu 4/14/05
15	CMMProgrammerSF	50%	20 hrs	0 days	Fri 4/8/05	Thu 4/14/05
16	PostDocU	100%	40 hrs	0 days	Fri 4/8/05	Thu 4/14/05

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	MechEngSF	100%	$1,694	$0	$0	$1,694
13	MechTechSF	100%	$1,160	$0	$0	$1,160
15	CMMProgrammerSF	50%	$580	$0	$0	$580
16	PostDocU	100%	$0	$0	$0	$0

Notes
This includes the final dressing of everything, installation of position monitors etc)

1.1.7.3.5.6	Contingency on closing spacetube	$0	0	0
1.1.7.3.5.7	SVX2b Ready for Installation into ISL	$0	0	0
1.1.8	**Italy Buy Backs**	**$3**	**0**	**0**
1.1.8.1	I-BB- on 1st chip layout	$1	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish
2	FNALR&D	0%	0 hrs	0 days	Thu 2/7/02	Thu 2/7/02
3	ItalyEQ	0%	0 hrs	0 days	Thu 2/7/02	Thu 2/7/02

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	($24,999)	$0	$0	($24,999)
3	ItalyEQ	0%	$25,000	$0	$0	$25,000

1.1.8.2	I-BB on Production SVX4 chip manufacturing	$1	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish
1	FNALEQ	0%	0 hrs	0 days	Wed 5/21/03	Wed 5/21/03
3	ItalyEQ	0%	0 hrs	0 days	Wed 5/21/03	Wed 5/21/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	FNALEQ	0%	($99,999)	$0	$0	($99,999)
3	ItalyEQ	0%	$100,000	$0	$0	$100,000

WBS	Name	Cost	M&S Cont.	Labor Cont.
1.1.8.3	I-BB on Power Supplies Procurement	$1	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish
1	FNALEQ	0%	0 hrs	0 days	Wed 1/14/04	Wed 1/14/04
3	ItalyEQ	0%	0 hrs	0 days	Wed 1/14/04	Wed 1/14/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	FNALEQ	0%	($131,999)	$0	$0	($131,999)
3	ItalyEQ	0%	$132,000	$0	$0	$132,000

1.1.9	**Japan Buy Backs**	**$4**	**0**	**0**
1.1.9.1	J-BB on prototype sensors manufacturing	$1	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
2	FNALR&D	0%	0 hrs	0 days	Fri 3/1/02	Fri 3/1/02	($96,672)	$0	$0	($96,672)
5	JapanEQ	0%	0 hrs	0 days	Fri 3/1/02	Fri 3/1/02	$96,673	$0	$0	$96,673

1.1.9.2	J-BB on production sensors manufacturing I	$1	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish
1	FNALEQ	0%	0 hrs	0 days	Mon 3/3/03	Mon 3/3/03
5	JapanEQ	0%	0 hrs	0 days	Mon 3/3/03	Mon 3/3/03

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	FNALEQ	0%	($378,326)	$0	$0	($378,326)
5	JapanEQ	0%	$378,327	$0	$0	$378,327

1.1.9.3	J-BB on production sensors manufacturing II	$1	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish
1	FNALEQ	0%	0 hrs	0 days	Mon 3/1/04	Mon 3/1/04
5	JapanEQ	0%	0 hrs	0 days	Mon 3/1/04	Mon 3/1/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	FNALEQ	0%	($221,865)	$0	$0	($221,865)
5	JapanEQ	0%	$221,866	$0	$0	$221,866

1.1.9.4	J-BB on L0 production sensors manufacturing	$1	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish
1	FNALEQ	0%	0 hrs	0 days	Mon 3/1/04	Mon 3/1/04
5	JapanEQ	0%	0 hrs	0 days	Mon 3/1/04	Mon 3/1/04

ID	Resource Name	Units	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	FNALEQ	0%	($85,058)	$0	$0	($85,058)
5	JapanEQ	0%	$85,059	$0	$0	$85,059

1.1.11	**Schedule contingency and reportable milestones**	**$0**	**0**	**0**

WBS	Name	Cost	M&S Cont.	Labor Cont.
"Schedule contingency and reportable milestones" continued				
1.1.11.9	**Reportable milestones - Level 2**	**$0**	**0**	**0**
1.1.11.9.1	Production chip Submission - Reporting	$0	0	0
1.1.11.9.2	Prototype Stave #1 available - Reporting	$0	0	0
1.1.11.9.3	Production Sensor submission (axials) - Reporting	$0	0	0
1.1.11.9.4	Testing of Prototype DAQ Chain Complete- go ahead for #2	$0	0	0
1.1.11.9.5	Milestone: all tests of stave installation, screen mounting, complete	$0	0	0
1.1.11.9.6	Go ahead for DAQ Preproduction	$0	0	0
1.1.11.9.7	Bulkheads Complete	$0	0	0
1.1.11.9.8	Go ahead for DAQ Production	$0	0	0
1.1.11.9.9	L0 prototype modules complete	$0	0	0
1.1.11.9.10	Production Staves Available	$0	0	0
1.1.11.9.11	L0 Supports Complete	$0	0	0
1.1.11.9.12	Stave installation begins	$0	0	0
1.1.11.9.13	Stave installation complete	$0	0	0
1.1.11.9.14	Outer Detector Complete	$0	0	0
1.1.11.9.15	SVX2b Ready for Installation into ISL	$0	0	0
1.1.11.9.16	Inner Detector Complete	$0	0	0
1.1.11.9.17	1st Chip ready for hybrids	$0	0	0
1.1.11.12	**Reportable Milestones - Level 1**	**$0**	**0**	**0**
1.1.11.12.1	Production Staves Available	$0	0	0
1.1.11.12.2	Outer Detector Complete	$0	0	0
1.1.11.12.3	SVX2b Ready for Installation into ISL	$0	0	0